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80micro

T.M.

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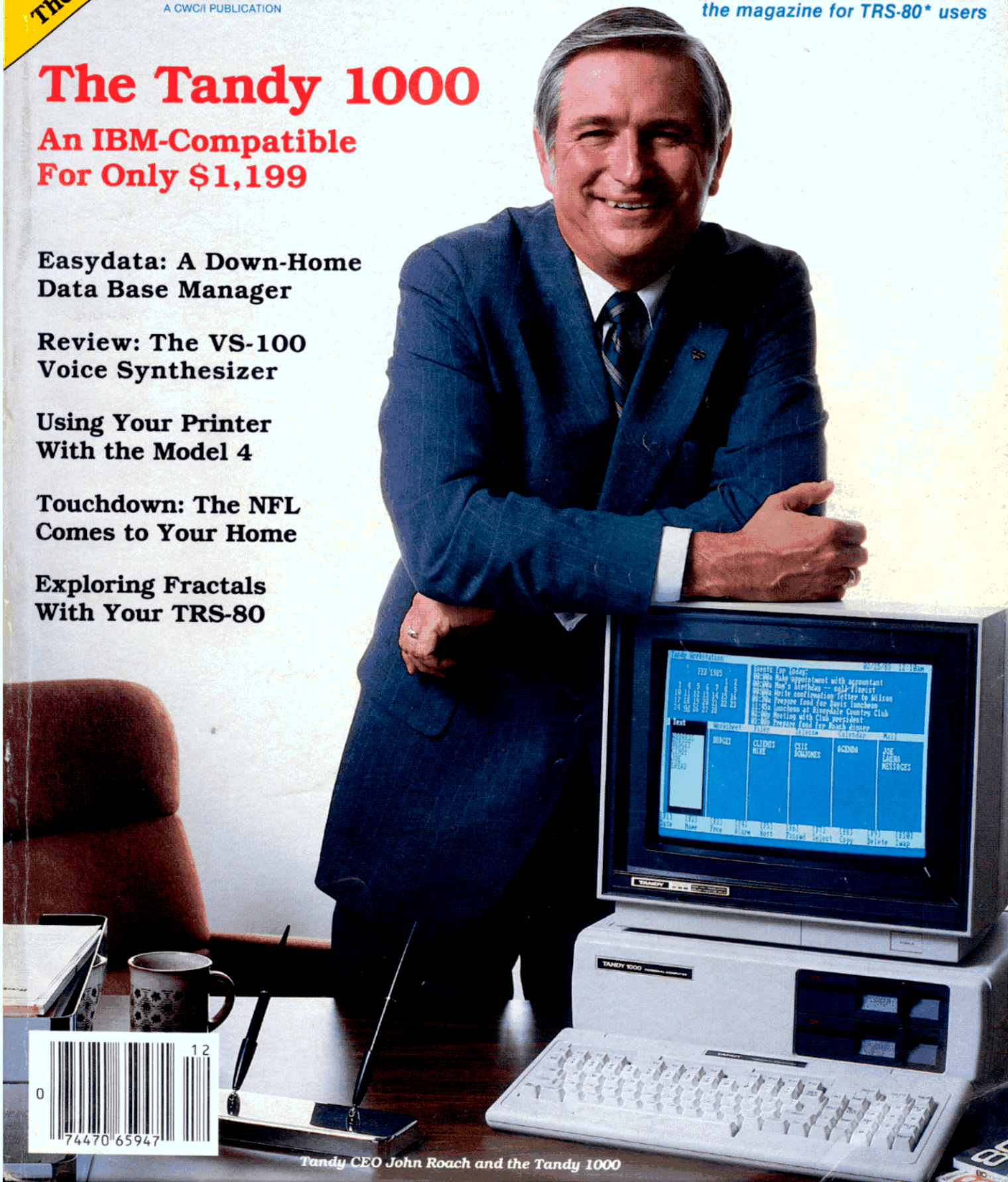
Review: The VS-100 Voice Synthesizer

Using Your Printer With the Model 4

Touchdown: The NFL Comes to Your Home

Exploring Fractals With Your TRS-80



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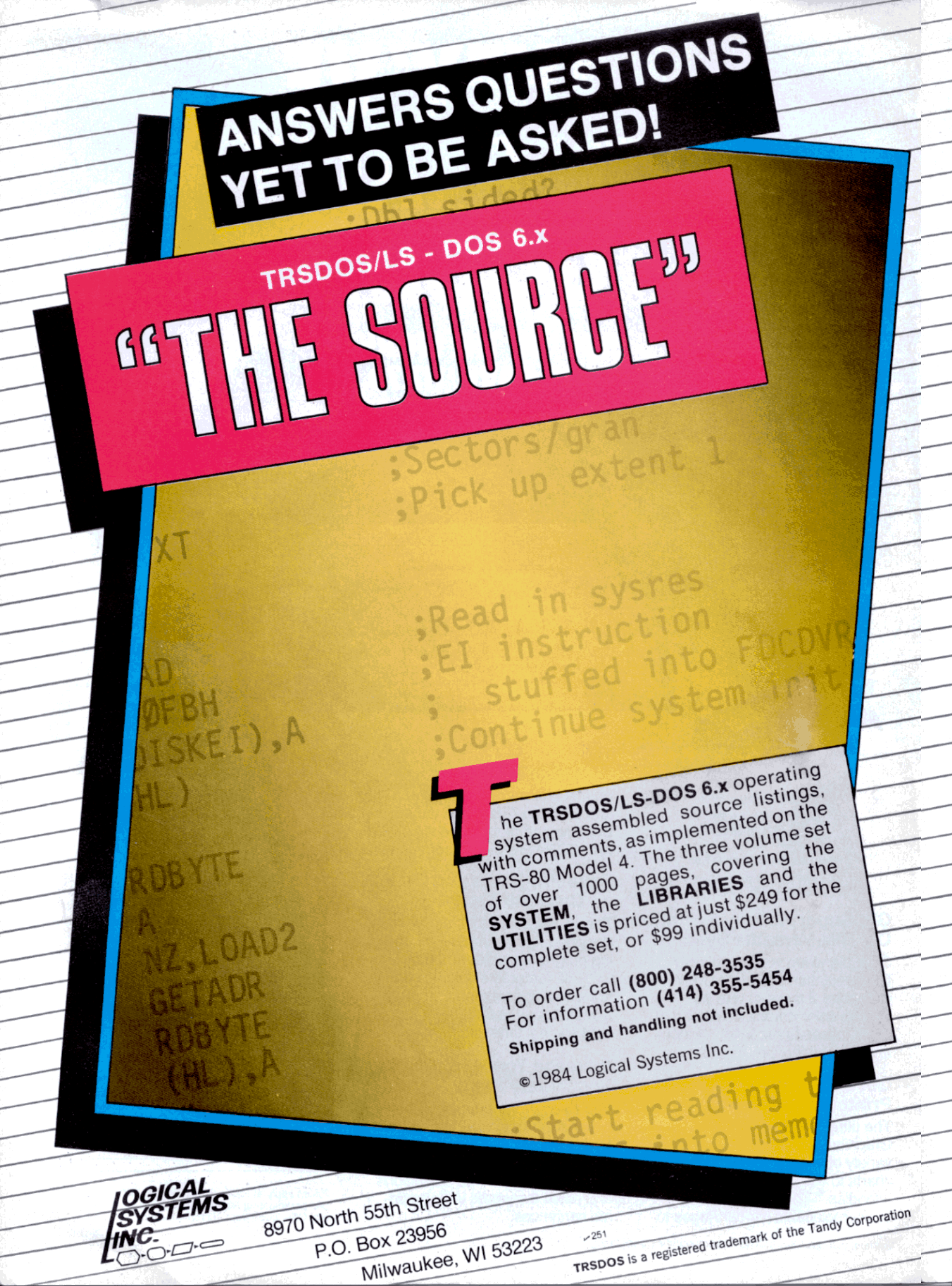

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80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of "How to Write for *80 Micro*." Payment for accepted articles is made at a rate of approximately $50 per printed page; all rights are purchased.

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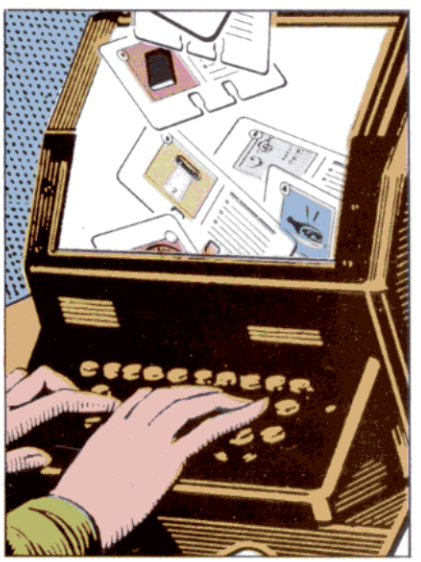

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Send in the clones.

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LOAD 80

Load 80 gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on tape or disk, and runs on the Models I, III, and 4.

Load 80 programs are ready to run, and can save you hours of time typing in and debugging listings. Load 80 also gives you access to Assembly-language programs if you don't have an editor/assembler. And, it helps you build a substantial software library.

Using Load 80 is simple. If you own a tape system, you load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, you must convert the programs from Model III TRSDOS to Model 4 disk using the Model 4 CONV command.

Not all programs will run on your system. Some Model III programs, for instance, will run on the Model 4 in the Model III mode, but not in the Model 4 mode. You should check the key box that accompanies the article to find out what system configuration individual programs require.

This page contains a list of this month's Load 80 programs. If you have any questions about them, call Keith Johnson at 603-924-9471.

Yearly subscriptions to Load 80 are $199.97 for disk, or $99.97 for cassette. Individual loaders are available on disk for $21.97 or on cassette for $11.47, including postage. Direct subscription problems or orders for Load 80 to Lori Eaton, c/o *80 Micro*, 80 Pine St., Peterborough, NH 03458.

Directory

Easydata
Article: Little Wonder (p. 72)
System: Models I, III, and 4, 32K RAM
Language: Disk Basic

A 200-record data base manager that resides in RAM. Features fast access to information and scrolling through data base.
Cassette filespec: B
Disk filespec: EASYDATA/BAS

Custom Character Sets
Article: Belles Lettres (p. 86)
System: Models I and III, 48K RAM
Language: Assembly/Disk Basic

Create and print out your own character sets on your dot-matrix printer in standard or enlarged fonts.
Cassette filespec: C, ALTCHA, D, ALTERN
Disk filespec: STANDARD/BAS, STAND/SRC (source code), DOUBLE/BAS, DOUBLE/SRC (source code). Requires Apparat editor/assembler.

Touchdown
Article: Touchdown (p. 103)
System: Model III, 16K RAM
Language: Cassette Basic

A real-time two-player football simulation. Winning requires careful strategy and the right breaks.
Cassette filespec: E
Disk filespec: FOOTBALL/BAS

Fractals
Article: Fractals: New Dimensions in Geometry (p. 114)
System: Models I and III, 16K RAM Cassette, 32K RAM Disk
Language: Basic

Apply the geometric theory of fractals to create new and unique graphics.
Cassette filespec: F
Disk filespec: FRACTALS/BAS

Chilly
Article: A Chill Wind Blows (p. 120)
System: Models I, III, and 4, 16K RAM Cassette, 32K RAM Disk
Language: Basic

Calculate wind chill factors based on temperature and wind speed.
Cassette filespec: G
Disk filespec: CHILLY/BAS

Message Board
Article: BBS Express (p. 136)
System: Model III, 48K RAM, 2 drives
Language: Assembly/Disk Basic

These program modules create a message index and read the BBS message board.
Cassette filespec: LIST1, H
Disk filespec: LIST1/SRC (source code), LIST2/BAS. Requires Radio Shack Editor/Assembler.

Pixels
Article: Basic Takes (p. 144)
System: Models I and III, 16K RAM Cassette, 32K RAM Disk
Language: Basic

This five-part menu-driven program includes demonstrations, a graph program, and a game.
Cassette filespec: I
Disk filespec: PIXELS/BAS

SetKey
Article: The Next Step (p. 156)
System: Model 4, 64K RAM
Language: Assembly

SetKeys lets you set the Model 4 function keys and reassign them at will.
Disk filespec: SETKEY/SRC (source code). Requires EDAS editor/assembler.

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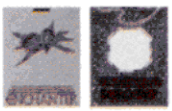

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MS-DOS for the Masses

I came away from our preview of the Model 1000 in Fort Worth with mixed feelings. My first reaction was, "So what?" Let's face it—the Model 1000 is, pure and simple, an IBM clone, and as a piece of hardware it's hard to get too excited about.

But then there's that price tag—$1,199 for 128K, a drive, MS-DOS, GW-Basic, and a host of ports for joysticks, a printer, a television set, a light pen, and a stereo. Add a second drive and a monitor, and the price is still only $1,658.90. Remember that the Model 4 went for $1,999 not too long ago.

This means that for the first time, the MS-DOS market has opened up to embrace the home user, the tinkerer, the casual programmer, and the hobbyist. The traditional Tandy customer can now test the MS-DOS waters without emptying his bank account.

Signs are that Tandy recognizes this potential customer base. First, it's offering a stripped-down version of the 1000, much as it has with its Color Computers and Model I/III/4 line. This lets the user start small and expand as his budget permits.

And second, the list of software Tandy will release along with the machine includes a number of education and entertainment packages.

The machine will, of course, attract businessmen as well. But these people will have more in common with the Model 4 user than the IBM PC user. They'll be interested in learning not only how to use their Model 1000, but how it works and how they can increase its capabilities.

One of the most interesting aspects of the Model 1000 is its potential to revitalize the TRS-80 third-party support industry, for several reasons.

To begin with, manufacturers of TRS-80 products will suddenly have a whole new group of buyers. The 1000 owner will have a host of needs to fill,

including software, peripherals, and expansion boards.

And second, the 1000 should appeal to PC manufacturers looking for new markets. They can sell their IBM products to the 1000 owner with little or no modification. Most important, for the first time they'll have easy access to the TRS-80 owner. No longer will they be forced to sell their goods in Radio Shack stores or through Express Order. They can offer Model 1000 products in regular retail computer stores along with their other IBM and MS-DOS merchandise.

Price, expandability, third-party support. These three ingredients could make the Model 1000 Tandy's biggest success yet. It may not be the most thrilling piece of hardware, but it's the machine Tandy needed to produce and Tandy customers should be glad to see. It's a hearty return to the mainstream of microcomputing.

But What About the 4?

Meanwhile, many Model 4/4P owners will be wondering if this means the end of their machine.

Tandy executives seem convinced that the Model 4/4P still has a market. In theory, the 4/4P will appeal to those who need an all-in-one system that handles simple word processing, data management, and number-crunching. The Model 1000, presumably, will be for users who need MS-DOS applications, IBM compatibility, or color graphics.

This doesn't seem like a realistic appraisal. The 1000, after all, can do anything the 4/4P can, and more. Why buy an 8-bit computer with a proprietary operating system when you can get an IBM-compatible system for a comparable price?

The 4/4P has a future only if the price continues to drop and Tandy can define a market that is clearly distinct from that of the 1000. The former is a possibility; the latter, however, is not.

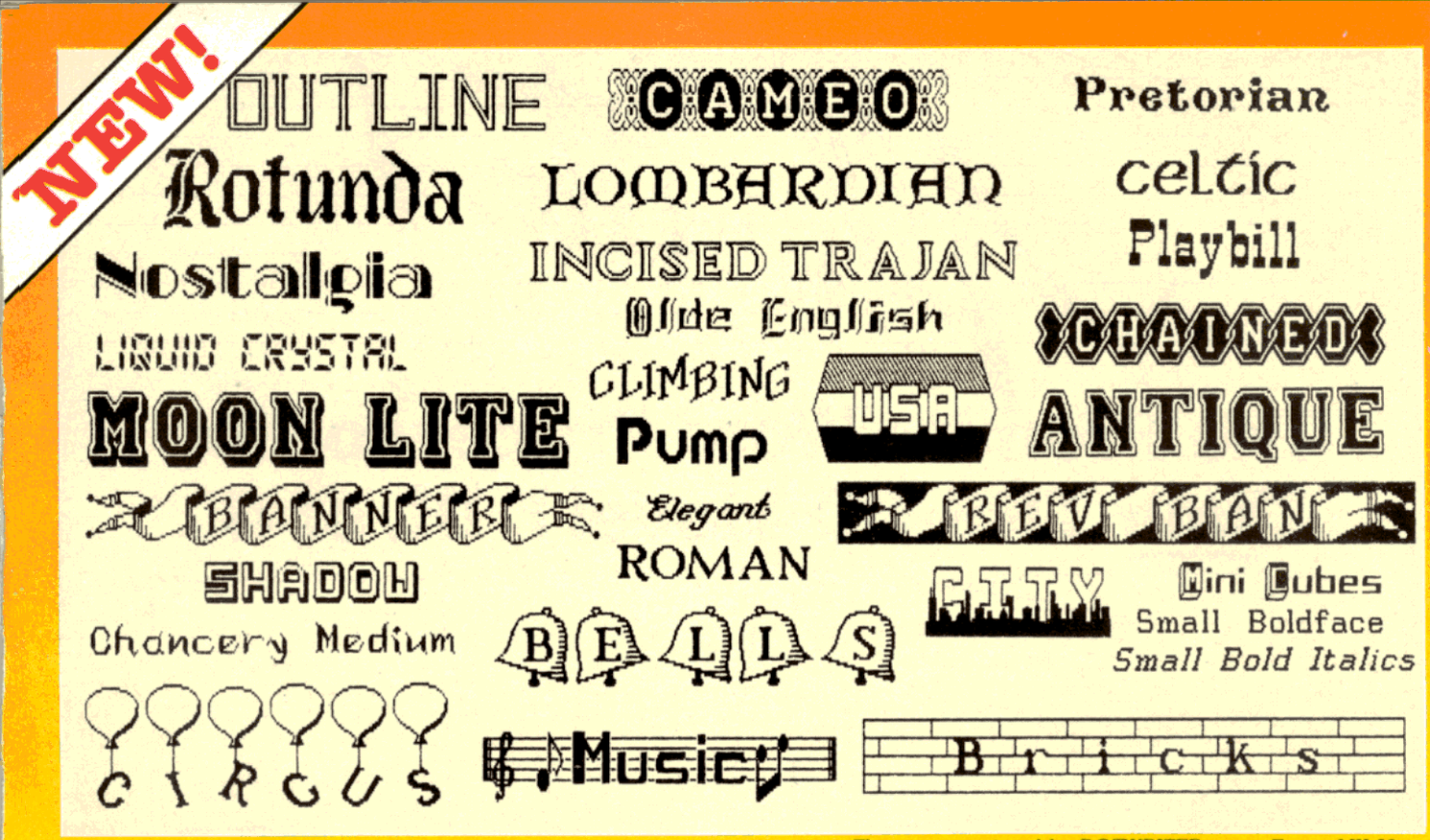
The bottom line is that the 1000 is the heir-apparent to the 4/4P's customer base. The 4/4P has suffered precisely because it's not an IBM. If it can't compete with the IBM, it won't compete with the Model 1000.

The Future

Before Tandy introduced the Model 2000 last November, the company didn't seem to have any overall direction for its computers. At the top of the heap was the 68000-based Model 16. In the middle was the Z80-based Model 4. And at the low end was the 6809-based Color Computer.

A year later, it's clear that Tandy intends to fill its three major niches with MS-DOS computers. Fort Worth has now taken care of the high-end and middle-level markets. It's reasonable to expect that, in time, the company will round out the line with a low-end IBM compatible.

The idea of a complete family of IBM-compatible MS-DOS machines is interesting. If Tandy can pull it off, it'll be the first microcomputer manufacturer to do so, and will have a chance to significantly improve its position in the mass-micro market. ■



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Our print samples were done on an Epson. Sizes vary on other printers. Some of the samples shown here are taken from the additional Letterset disks.

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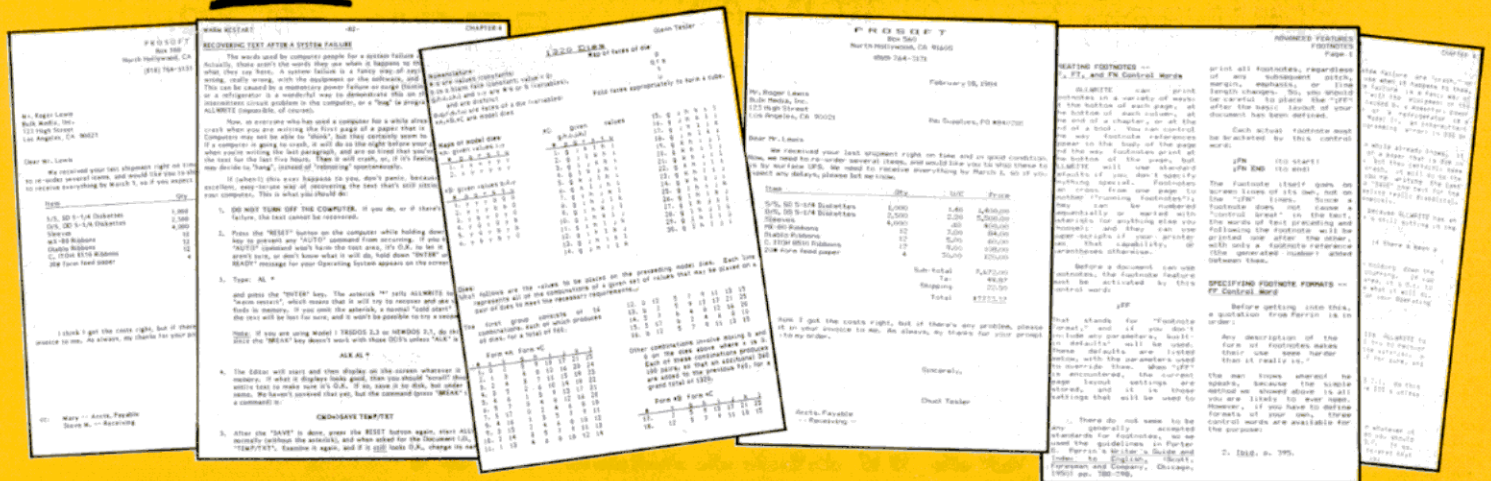

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You can set and change on-screen tabs and store them on disk. The print-time tabbing features are incredibly versatile: they allow left, right, and centered tabs, and even line up your decimal points.

ALLWRITE shows you where you forgot to turn off underlining, boldface, italics, or double-width. Special on-screen Preview feature shows page breaks and page layouts...including underlining and boldface ...without annoying blinking or screen flicker. In "Summary" mode, ALLWRITE quickly flags formatting errors without wasting time printing all the text. These standard features make document preparation faster and easier than ever!

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There is no upper-limit on document size with ALLWRITE, because it chains files *backwards* as well as forwards, even across diskettes. Switch from one chained file to another in less than six seconds by pressing two keys. Select portions of other files for inclusion at print time...great for stock paragraphs.

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and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

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You can store **22 phrases or commands at a time into "soft-keys,"** then press just two keys to retrieve them. This makes frequently-used phrases and formatting controls *a snap to* use. You can store these definitions on disk and build a library of hundreds of pre-programmed keys to fit every one of your applications.

Our specially-designed templates fit right on your keyboard to let you see your settings at all times. Each template is also a Reference ("Cue") Card, so it is always right in front of you when you need it, without using up valuable screen space.

ALLWRITE Is Easy To Learn

ALLWRITE's commands and control keys are easy to remember because they use the first letters of common English words: 'CE' stands for 'Center,' 'Search' and 'Replace' do just that, and so forth. The **on-line HELP menu** offers over fifty screens of topics.

NEWSCRIPT's documentation was acclaimed in every review, and ALLWRITE's 350-page book is even better. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 20 years, and understand the importance of good documentation.

To make installation easy, we include Tiny DOSPLUS for the Models I and III, and special, pre-tailored versions of **both** TRSDOS 6.2 **and** DOSPLUS IV for the Model 4, all at no extra charge. The Model I and III versions work equally well with all major DOS's.

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Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry. There is no time limit to our support: if you are our customer and you need help, just call or write. We give free updates for 90 days, and charge little or nothing for minor updates thereafter.

Customer Comments

"This is the best software package I have ever received . . . superb, easy to use, fast, and has more features than the business word-processor at the office." *(E.R.L.)*

"ALLWRITE is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use."

80 MICRO, Nov., 1984

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". . . a very readable manual." *(D.S.)*

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Management Decisions

John B. Harrell III, in 2000 Plus (August 1984, p. 177), omits several worthy points when he compares Profile to dBase II. For example, Harrell fails to mention Profile's ability to span disk drives: up to eight, compared to dBase II's one.

Profile can sort and index any of its segments. Profile also offers more space wth 999 fields and 4,608 characters as opposed to dBase II's 32 fields and 1,000 characters. In addition to creating multiple screens and reports, Profile builds one data entry screen and one report format automatically.

In light of these omissions, I'm forced to conclude that Harrell didn't use the version of Profile developed for the Model 2000.

H. Christopher Ayers
Seattle, WA

John B. Harrell III unfairly compares dBase II with Profile. His basis for comparison is lopsided as the two products are meant for two different machines: dBase is for the Model 2000, while Profile is for the Model III. Had Harrell compared dBase II with FilePro 16, designed specifically for the Model 2000, he'd realize that FilePro far exceeds the capabilities of dBase II.

John J. Esak
Vice President
The Small Computer Company
New York, NY

SuperScripsit Debated

I disagree with Terry Kepner's review of SuperScripsit for the Model 4 (August 1984, p. 184). While SuperScripsit for the Models I and III is a fine piece of software, the Model 4 version is unsatisfactory.

The most obvious bug is that the keyboard/keyboard buffer doesn't keep pace with the touch typist; it drops characters during word wraps and at the end of the line. A second

problem is the trashing of long files during scrolling and disk access. This bug alone renders the program useless.

John L. Ragle
Amherst, MA

Kepner's review of the Model 4 SuperScripsit Dictionary is shortsighted.

The MEMDISK feature on the Models 4 and 4P lets you gain a 57K useable disk drive in RAM. You can then copy documents from a data disk to MEMDISK, remove the data disk, and insert the SuperScripsit Dictionary. When you're finished checking your documents, simply copy them back to the data disk. As a Model 4P user, I find MEMDISK invaluable.

A. Ackart
Ventura, CA

After reading Terry Kepner's review of SuperScripsit, I feel compelled to comment. First, Kepner's statements regarding the reset button are inaccurate. If a file is closed with control/Q (exit document), it can be reaccessed, even if a subsequent exit was by means of the reset button.

Also, you can preserve a document under a different name with a one-drive system, although it's more difficult. The control/R recalls the copied text under the new name after you block and copy the original document. The biggest problem with this is the lack of available disk space as the same disk must accommodate the original, the copy, and the new document.

When used with an appropriate printer, SuperScripsit provides features lacking in most word processors: micro justification, proportional spacing, double underlining, and true boldface.

Robert B. Ormsby
Newhall, CA

A reviewer's criticisms should be realistic and appropriate. Kepner, in his review, doesn't exhibit either of these qualities.

Kepner doesn't address the differences between SuperScripsit for the Models III and 4, nor does he discuss the Model 4 features that can't be used with SuperScripsit. In addition, it's unrealistic to expect SuperScripsit to work with full efficiency in one drive.

Kenneth W. Collins
Falls Church, VA

I didn't experience difficulty with the keystroke, nor did I notice problems during scrolling or disk accessing. As TRSDOS 6.X is a very reliable DOS, I'd suspect power-line problems before blaming SuperScripsit. I don't think it's unfair to expect SuperScripsit to work on a one-drive system; other, more powerful word processors manage with one disk drive.

It's true that certain Model 4 features aren't compatible with SuperScripsit. For example, the Model 4 print spooling and keyboard filters don't work because SuperScripsit makes system calls that circumvent those features of TRSDOS 6.X. Furthermore, TRSDOS 6.X doesn't honor the TRSDOS Himem pointer.

Unfortunately, the extended memory provided by MEMDISK doesn't satisfy the 174K required by the SuperScripsit Dictionary.

Terry Kepner
Peterborough, NH

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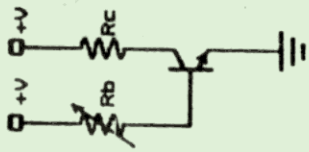

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Q: How do I LPRINT a program that uses the Set statement to show, for example, curves plotting stock market prices? I have a 48K, two-disk-drive Model I and an Epson FX-80 printer. The Epson doesn't recognize characters like CHR$(132) as TRS-80 graphics blocks. *(Harold Lange, Miami, FL)*

A: I take it that you find it too limiting to dump graphics by screen. If length is the problem, you can chain several screen dumps to make a longer paper dump. As for width, you have an 80-column printer, so you can modify a screen dump program to print only 80 video spaces. Set graphics blocks in the first 80 spaces of the screen, then dump them to the printer. Now set your second line of graphics in the first 80 video spaces, and repeat until you've finished. You could set this up as an automatic subroutine for plotting; determine what blocks to set in the top line of your graph, print it, go to the next line, etc.

Meanwhile, does anyone have a routine that lets you use the Set command with LPRINT (preferably modified to allow more than just 128 blocks horizontally)?

Q: I'm thinking of buying a Holmes Engineering VID-80 board for my Model III, but only if it will give me an 80-column display in SuperScripsit and more memory. I gather SuperScripsit won't run in the 80-column mode because the VID-80 uses a different area in RAM for the video driver. Is that right?

Also, I make extensive use of SuperScripsit's Compress routine, but I find it doesn't work if I use the same file name for the compressed file and if the initial file is much more than 8–10K. Similarly, I find Electric Webster locks up if a SuperScripsit file is much more than 12–14K. *(Bob Munzenrider, Middletown, PA)*

A: You're right about the VID-80 board being incompatible with SuperScripsit. And you don't get the extra 16K of RAM; this extra memory is bank-switched to replace the ROMs when you want a true 64K RAM computer, such as with CP/M. SuperScripsit loads above the ROM, so it ignores the extra RAM.

The Compress routine is designed to work only with separate file names for old and new files. As for Electric Webster, you'll have to contact the manufacturer about the problem.

Q: Do you know of any books that teach beginning Pascal, Cobol, or other languages? Also, I'd like to know if I should get a CP/M 2.2 board, a CP/M-86 128K RAM 16-bit upgrade, or a CP/M transfer program for my CP/M needs. *(Michael Shimoide, Kingsburg, CA)*

A: Your best bet is to check your local library for books on computer languages; you can also check magazine back issues for software reviews of language packages (they usually have book recommendations).

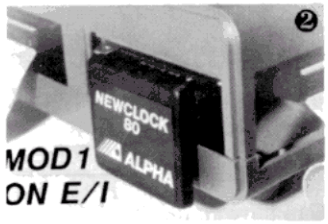
At the moment, you can't get a program for transferring CP/M programs to TRSDOS format. For machine-language programs you'd have to rewrite the keyboard, video, and disk input/output routines to match your DOS. Basic programs would translate rather easily, except for certain commands not supported by TRS-80 Basic that are used in CP/M Basic. If you want to upgrade your Model III, there are several adapter boards on the market. I prefer the Holmes Engineering board.

Q: I'm having problems with wafers for the Exatron Stringy Floppy system. Some older wafers (purchased two or more years ago) will no longer certify with @NEW and I can't add programs to older wafers that still have space available. Some newer wafers (mostly those with blue drive wheels) will @SAVE programs OK, but won't accept data from data I/O programs or Scripsit. Newer wafers, and all wafers from A & J Micro Drive under the Entrepo label, have worked perfectly.

On another subject, how can I get my Model I Level II to stop after every page when I print so I can feed a new sheet into my printer? *(Charles Steele, La Jolla, CA)*

A: The problem with the oldest tapes is probably age. Wafer tapes, like cassette tapes, are just a polymer base with a thin coating of iron oxide particles. As the tape gets older, the iron oxide begins to wear, crack, and even peel off. This affects the tape's ability to store data. The wafer tape drive head also needs occasional cleaning (cotton swabs and alcohol) and demagnetizing to restore it to top performance. First clean the wafer drive, then take one of the older tapes and bulk erase it with a powerful magnet. If you still can't get a program to certify on that tape, it's dead. As for the data-versus-program prob-

Newclock-80 $69.95



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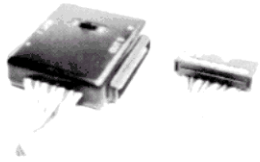
Connection: Model I: plugs into the keyboard or expansion interface. Model III: plugs into the 50-pin I/O bus. Compatible with all operating systems.

Printswitch $59.00



Do you have 2 printers? Get a Printswitch. Stop plugging and unplugging those printer cables. With the Printswitch, you can have 2 printers connected to your computer and you can select either one at the flick of a switch. Works with any printer, plotter, or device that uses the parallel printer port. Simply plug the 14 inch Printswitch cable into your computer, and plug your existing printer cables into the Printswitch. This is the nicest unit on the market. Superior quality board with gold plated edge connectors. For Models I,III, 4 and 4P.

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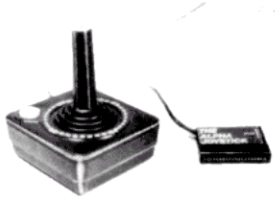

When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0) to read the joystick position (8 directions and fire button). Model I: plugs into keyboard or expansion interface. Model III, 4 and 4P: plugs into 50-pin I/O bus. The Alpha Joystick comes fully assembled and tested, ready to plug in and enjoy. (Specify Model I, or Model III,4).

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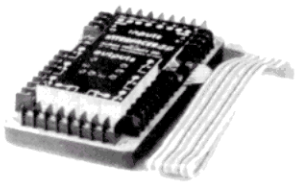

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Connection: Mod I: 40 pin bus. Mod III, 4, 4P: requires 50-pin I/O bus converter ($39.95), plugs into 50-pin I/O bus. Comes complete with power supply, cable, and detailed manual.
(Up to 8 interfacers can be connected to your TRS-80 using our Y- cables).

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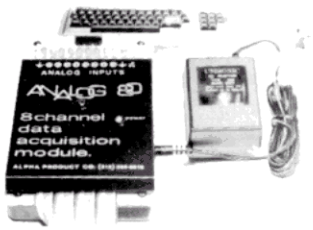

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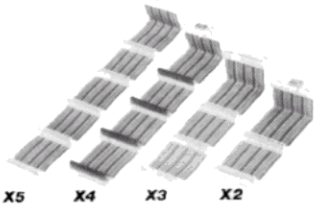

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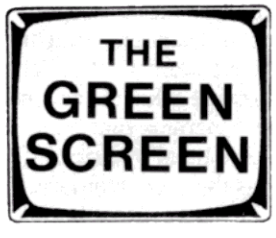

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lem, I can't tell why one works and the other doesn't.

All of the LLIST formatting programs I can find are for disk systems. Can anyone help?

Q: I replaced my Model III with a dual-drive Model 4 back in July 1983. Whenever I use LeScript or Model 4 Basic 1.00.00, the system freezes or reboots as frequently as every 10 minutes for no apparent reason. This never happens when I'm working in the Model III mode. *(Steve Weeber, Fremont, MI)*

A: LeScript wasn't designed to operate in the Model 4 TRSDOS 6.X.X environment. That's why you get the consistent reboots. In the Model III mode, all the peripheral addresses are the same as for a Model III computer, so the program behaves properly. You need to patch LeScript before it will operate reliably under TRSDOS 6.X.X.

From your description, I'd suspect that your version of Basic has a bug. Every copy of Model 4 Basic I've seen so far performs without reboots. Contact your local Radio Shack and see if an updated version is available. By the way, TRSDOS 6.2 is now available; contact your local store for details on upgrading. It offers much faster disk I/O and several other improvements.

Q: How can the LNW Team computer be compatible with the TRS-80 Models I, III, and 4 and still be able to address 160K of memory? *(Rick Chandler, Brentwood, TN)*

A: It's all handled by the DOS. It isn't difficult to get the Z80 microprocessor to address more than 64K—you just use memory bank-switching techniques and good program overhead management. As long as you don't mess up the low memory peripheral input/output addresses, you can maintain compatibility with all the standard DOSes. The only difficulties are with certain machine-language programs that contain all-internal peripheral control. They won't address the extra memory.

Q: I'm looking for an accounts receivable program (balance forward type) for my dual-disk Model III. It should handle 1,500 accounts with an average of five entries per month. I'd also like to find a program for bowling league scores; it must handle handicaps and be easy to use. *(Chris Seigler, APO NY)*

A: I can find only one source for such a program: Data Auto Services, 2145 N.W. 10th St., Gainesville, FL 32601, 904-372-3267. The program requires a 5-megabyte hard disk and retails for $750. Considering the number of accounts, no matter what computer system you use, you'll need a hard disk to track everything.

I found two bowling programs: Bowling League Secretary, disk-based, retails for $50 (O-K Audio, 543 Cedarwood Court, Middletown, OH 45042, 513-423-0321) and Bowlstat 1.5, Model I disk-based, retails for $69.95 (Datascore, P.O. Box 995, Sharon, PA 16146, 412-346-3069).

Q: Is LeScript compatible with printer drivers such as Prosoft's Dotwriter, or Pioneer Software's SCRIPTR, or any other driver that provides a wider choice of type fonts on the C.Itoh 8510 printer with a Model 4? A representative of Anitek says LeScript wasn't intended to be compatible with any other software. This seems to contradict LeScript's documentation, which indicates the program is compatible with Electric Webster. *(William Davis Jr., Wellsboro, PA)*

A: I believe LeScript includes the drivers for most printers on the market as part of the program package. As a result, it wasn't designed to integrate with third-party printer drivers like the ones you mention. Its integration with Electric Webster was a deliberate design function, and you'll find that other spelling checkers, while they can process LeScript files, won't integrate directly with LeScript. Does anyone know of a C.Itoh 8510 driver for LeScript?

Q: I own a Zenith Data Systems Z-100 minicomputer. I operate a Z-DOS/MS-DOS 8- and 16-bit system. My Basic is Microsoft's Z-Basic Rev. 1.0. Will TRS-Basic run on my machine so I can use programs published in *80 Micro*? *(Warren C. Hendrickson Jr., Summerfield, FL)*

A: As I recall, Z-DOS is like CP/M, and has a standard Microsoft Basic. If that's the case, practically all Basic programs for the Models I/III/4 and II/12/16 will work on your computer. You can also use them in the MS-DOS Basic environment. However, Z-DOS and MS-DOS Basic don't support some TRS-80 Basic commands like CMD "0" (string-array sort), and programs that use TRS-80 graphics commands won't work without alterations. You would have to adjust machine-language programs to allow for different video, keyboard, and disk I/O routines.

I suggest that you try out some programs from back issues of *80 Micro* to see if they're compatible with your system.

Q: Here's an answer to Otto Weills' question (June 1984, p. 16) about backing up a data disk; I use this method with Profile III Plus. Begin the back-up with your system disk in drive zero and a formatted disk in drive 1. Before you answer the query, "Disk contains data; are you sure you want to back up?", take the system disk out of drive zero and replace it with the formatted disk. Then answer yes to the query. Answer no to the prompt, "Do you wish to reformat?". The computer executes the back-up.

I'd also like to pass along some information about using Profile III Plus with floppy disks. When you run a Profile-generated program, you don't have to have a separate system disk for each data disk as long as the fields, math formulas, and user menus are the same. Create the control files Master/KEY, Master/DAT, Master/DA2, and Master/DA3 and give your data files a common title such as Collect0. You have to tell the program that you want to put all DATS (data) in drive 1. The drive 1 directory should look like this:

```
COLLECT0/DAT
COLLECT0/DA/2
COLLECT0/DA/3
```

Whenever you add records, give drive 1 as your destination drive. *(Henrietta Clements, Griffin, GA)*

A: For a similar back-up technique, see the September 1984 Reader Exchange (p. 29). Thanks for the advice.

Q I purchased the utility Transfer to help me convert some Basic programs to run on an MS-DOS machine. The portions of the utility that deal with MS-DOS-format disks don't seem to work. My Model III has two internal drives that have given me no problem under TRSDOS 1.3. I had the speed of drive 1 adjusted but that didn't help. I bought a third drive and I'm still getting nowhere with the utility. Every time I try to use drive 1 or 2 as an MS-DOS drive I get a disk I/O error message. I took the utility to a Radio Shack and it worked fine on a Model 4 in Model III mode.

I bought the computer from VR-Data in 1981 and they installed the original drives. Is the floppy controller board OK? It works fine under TRSDOS. I'm at my wit's end. *(Jerry Sonnenberg, Melbourne, FL)*

A I suspect the problem is with the controller board. Transfer was designed to operate using the Radio Shack controller board, and does function properly, as it works on a Model 4 in Model III mode. The Model 4 and Model III handle disk I/O in essentially the same way; I think the problem lies in the different parts used in the Radio Shack and VR-Data controllers. MS-DOS requires a slightly different data storage method on the disk (TRSDOS uses 256-byte sectors, while MS-DOS uses 512). This is apparently just enough difference to push the VR-Data board beyond its abilities, giving the error messages.

I suggest you arrange with a friend to use a standard (all Radio Shack) Model III when you want to transfer a program from a TRSDOS-format to an MS-DOS-format disk. Does anyone else have any ideas?

Q I want to add disk drives to my Model III, and I have a number of questions. Do slimline, half-height drives have any significant disadvantages compared to full-height drives? I'd rather put four drives in the machine than have two internal and two external. Is heat a problem?

It appears from the technical manual that the Model III can use double-sided drives without any modifications, but I've seen no references to them. Is there something undesirable about them? The technical manual also indicates that all drive motors turn on when you access any drive; doesn't that wear the drive motors and require a much larger power supply?

I've seen some ads for 80-track and 80/80-track drives. Is this a case of trying to squeeze too much onto a disk, causing frequent errors and alignment problems?

I've noticed that Micro Data Supplies advertises the Diskit III upgrade without drives for $219 while Displayed Video's price is $349. The products seem similar; why the $130 difference? *(William H. Lewis, Lansing, MI)*

A Slimline drives, as far as I know, have no mechanical disadvantages; besides taking up less space, they have fewer circuit chips and require less power. Four of them in a cabinet could lead to a heat problem, so you should add a vent fan to your computer; just tack it on top. Make sure the power supply you buy is powerful enough for all four drives as well as the rest of the computer.

The use of double-sided drives is a function of the DOS; you can easily access them through LDOS, MULTIDOS, DOSPLUS, NEWDOS, and other operating systems. TRSDOS 1.3 isn't designed to use double-sided drives and would require extensive patching. A disadvantage to double-sided drives is that you usually can't swap disks with systems using single-sided drives. That's one reason you don't hear more about double-sided drives.

Yes, the drive-select and motor-on signals are separate and that does put strain on the power supply. 80-track drives are as reliable in operation as 40-track drives, although they're more sensitive to alignment problems.

As for the two upgrade kits, I don't know why their prices differ.

Q I recently bought a Model 4 and I'm busy converting my Model I programs. Most CMD games run fine under TRSDOS 1.3 in Model III mode, but instead of getting graphics blocks I sometimes get a character that looks like an oversized A. The Model 4 manual (p. A-59) designates this character as code 255 of the alternate character set. How can I display the regular graphics character?

A more general question: I've read about CMOS chips and a CMOS version of the Z80A. These chips apparently save energy and create less heat than regular chips. Would converting my Model 4 processor and memory to CMOS increase my system's longevity by reducing operating heat? Would there be any negative side effects beyond voiding the Radio Shack warranty? *(Gary W. Shanafelt, Abilene, TX)*

A First, you have to determine what the normal graphics code is supposed to be. According to the manual, character 255 isn't even a graphics character, it's a space-compression code. The character must be 191 (255 is exactly 64 above it, and there are only 64 graphics characters). It would seem that bit 7 is being set when it isn't supposed to be set, or that the Model 4 is interpreting instructions from the program as orders to set that bit. Only the programmers know for sure if the problem is their program or the hardware. Does anyone have a solution?

Alas, you can't just plug in CMOS chips. In most cases, the pin-outs of the CMOS chips have been rearranged, usually because the +16 volt line has been eliminated. Plugging these chips into the old sockets with that line active will destroy them. You'd have to get chip pin-out diagrams for all the chips you intend to replace, compare them for compatibility, and take the appropriate action (cutting traces or adding jumpers). One disadvantage of CMOS chips is that they're slower than their standard counterparts.

Q I'm quite pleased with Radio Shack's Model 4 hi-res graphics board, but I find I can't print screens with my Epson MX-80 printer (with Graftrax). I have no trouble getting the graphics to print with a Radio Shack dot-matrix printer. *(John T. Martino, Lancaster, PA)*

A What computer are you using? If it's a Radio Shack, then of course it won't work on your Epson; the methods of printing dot graphics are different. What you need is a driver program for the Epson. Does anyone know of such a program? ■

Terry Kepner is a freelance writer and programmer. He writes monthly columns for Portable 100 Magazine *and* 80 Micro. *He's been writing about microcomputers since 1979.*

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Tandyland

edited by Bradford N. Dixon

Tandy's mid-August announcement of its first quarterly decline in sales in six years sparked an in-depth analysis of the company in the *New York Times*. The paper reported that computer sales, which account for a third of Tandy's $2.7 billion annual revenue, had slipped and that Tandy needed a new product or a shift in marketing strategy to take up the slack.

This uneven performance isn't new to the Fort Worth-based firm: During the 1970s, Radio Shack was the front-runner in citizens band radio sales, but when that market collapsed in 1977 Radio Shack was caught flat-footed and in search of a product to keep sales figures on track.

Enter the home computer. In 1979, Radio Shack computers and software accounted for 9.5 percent of the company's total factory shipments. By 1983, micro sales led factory shipments with 34.6 percent of total sales (see the Figure). Within this same time period, home computer sales contributed to Tandy's 35 percent annual growth in profits.

But Radio Shack is feeling the effects of the current softening in the personal computer market. Acknowledging his company's recent lackluster performance in a tough market, Tandy chief executive officer John Roach told the *Times*, "There are undoubtedly some things that we could have done smarter." In fact, Tandy must take a strong sales and marketing initiative to regain its early leadership position in microcomputer sales. And it may be doing just that with the Model 1000 (see related stories, pp. 6 and 44).

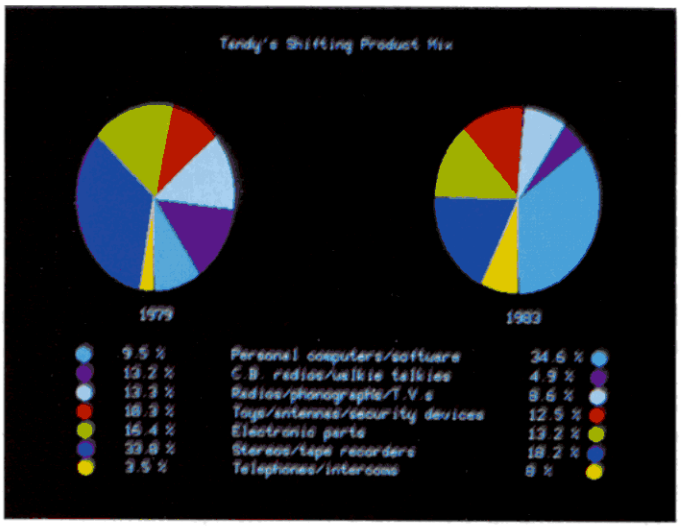

Figure. Factory shipments of Radio Shack products in 1979 and 1983.

The headline on an Aug. 16, 1984, news release from Tandy was upbeat: "Tandy Corporation reports 22nd consecutive year of increased annual earnings per share." The good news for shareholders was an increase in the fiscal 1984 net income per share to $2.75, up from $2.67 in fiscal 1983.

Other financial news from the Tandy Towers was also optimistic, despite some unimpressive numbers. An 11 percent rise in sales during fiscal 1984 translated into a net income gain of only 1 percent. In hard figures, sales for 1984 totaled $2.74 billion versus $2.48 billion in 1983.

Though fourth-quarter 1983 sales were up 2 percent, net income for the period fell from last year's $74.5 million to $58.4 million.

Update

Free software, just $14.95. There seems to be some confusion about the price of Radio Shack's new PC Maker program, a disk formatter that lets the Tandy 2000 write IBM PC-readable disks (see the September 1984 Pulse Train, p. 22). In its press release introducing PC Maker, Radio Shack says the program is free to registered MS-DOS owners using the 2000. However, the price index at some Radio Shack Computer Centers lists the product at $14.95. Tandy 2000 owners should be aware that as far as Fort Worth is concerned, PC Maker is free.

Meanwhile, whatever its price, the program seems bound to disappoint some users. John Harrell, who writes *80 Micro*'s 2000 Plus column, reports that PC Maker formats only single-sided, single-density disks. The portability to and from the PC is there, but the limited storage capability is a serious drawback.

Back in March 1984, Intel Corp. contracted with Advanced Micro Devices (AMD) of Sunnyvale, CA, to manufacture Intel's 80186 microprocessor, the brains of Tandy's Model 2000. Now Intel and AMD have strengthened their alliance with a second licensing agreement that has AMD manufacturing Intel's 80286, the central chip in IBM's new multiuser micro.

AMD expects to have the 80286 in full-volume production by the second quarter of 1985. It will be interesting to watch whether the number of 80186 units shipped suffers as AMD takes on the 80286. If AMD fails to meet its fourth-quarter 80186 production quota, some might wonder if IBM, which holds 20 percent of Intel's stock, had anything to do with it.

Manufacturer	Market Share
Commodore	42 percent
Sinclair	18 percent
Atari	12 percent
Tandy	8 percent
Coleco	4 percent
Others	16 percent

Table 1. Estimated worldwide market share for computers costing under $1,000.

MicroTrends

In the past few months, print-media industry watchers have said the day of reckoning is at hand for the microcomputer industry and that the shakeout of the micro market has begun.

To check the doomsayers' predictions, the market research firm Dataquest estimated worldwide market penetration of the top micro manufacturers. Dataquest listed only one manufacturer in its top five firms in the under-$1,000 price range *and* in the $1,000–$10,000 market. IBM? Apple? Nope, it's good old Tandy Corp.

In terms of worldwide market share, Dataquest estimates Tandy holds 8 percent of the under-$1,000 market (see Table 1). In the $1,000–$10,000 market, Tandy garnered 4 percent of the estimated world market in 1984 (see Table 2). These figures put Tandy in fourth place in both markets. The under-$1,000 market is headed for big changes in coming months, due to price cuts for the Apple IIe, IBM PC*jr*, and Tandy's Models 4 and 4P.

The shakeout may be on, but Dataquest forecasts that 14.1 million computers priced at $10,000 or less will be shipped worldwide in 1984. That's up 58 percent over last year.

As far as multiuser micro systems go, the industry may finally be catching up to Tandy. An article in the Aug. 6, 1984, *Wall Street Journal* supports the assertion Tandy made two years ago: that multiuser systems would soon be a major force in the microcomputer marketplace. Lower costs are generating more interest in multiuser micros among buyers of low-end business systems.

Infocorp, a Cupertino, CA, market research firm, predicts sales of multiuser systems will increase 36 percent a year through 1988 and reach a sales plateau of 1.8 million systems per year.

Tandy may have been a little ahead of its time in introducing a multiuser system two years ago. Garland Asher, Tandy's director of financial planning, recalls, "It [the introduction] was a non-event, but volume this year is twice last year's. Now we think we were 18 months too early."

Typical of most newer multiuser micros, Radio Shack's Model 16B costs $10,489 and includes hard disk storage, two terminals, and a printer. Such a system is a far cry from the not-so-distant past when businesses had to buy $50,000 IBM computers and spend another $50,000 for special software.

"Homeless computers for computer-less homes" is the slogan of an upstart company in Mississauga, Ontario, called International Computer Orphanage (ICO). The doors of the orphanage officially opened on Aug. 15, 1984, and the company is now hard at work placing unwanted and unused computers.

According to ICO president Brian Keenan, 3 million home and business computers were sold in North America in 1983, but an estimated 600,000 of them now spend their days unplugged and unused. He expects that number to rise to over 2 million neglected computers within a few years.

Keenan feels his agency is just what's needed to turn these shelf-top loiterers into productive members of society. "People have always been hesitant to buy new computers because of the expense involved and the constant technological changes, and used computers have been a giant headache for both buyers and sellers," he says. "Adoption is an easy and affordable way to bring orphan computers into your home or business."

Perhaps the concept of finding new homes for old or neglected computers is noble, but aren't they on the shelf in the first place because they're too cheaply made to fix and they're no longer powerful enough to do what a new machine can do at a better price? Nonetheless, readers sympathetic to the plight of homeless computers can get information about computer adoption from the International Computer Orphanage, 6711 Mississauga Road, Suite 103, Mississauga, Ontario L5N 9Z9, Canada.

Manufacturer	Market Share
IBM	24 percent
Apple	18 percent
NEC	5 percent
Tandy	4 percent
Acorn	3 percent
Others	46 percent

Table 2. Estimated world-wide market share for computers costing $1,000–$10,000.

New Threads

A new wardrobe, a remodeled house, and a 4P. This year, for the first time, *McCall's* magazine included computer equipment in the prize list for its Reader of the Year contest, and the equipment was all from Tandy. Keeping the Model 4P company were a DWP-210 printer, Scripsit, PFS:File, and the game 13 Ghosts.

The winner, Diana Hindt, an oilfield equipment salesperson from Katy, TX, said she'd use her new computer to write letters, keep the family budget, track food prices, and teach programming to her children.

As home computer users move toward more serious and varied applications, software distributors will have to become more sophisticated marketers. Instead of simply supplying games, by 1987 vendors will become educators and demonstrators of nonentertainment software, according to The Story Angler, a periodical service provided by Link, a subsidiary of International Data Corporation.

Link's report noted that the distinction between entertainment and educational software, now blurred in programs like educational games, will become clearer. The report also foresees increased integration between home business and home productivity packages in products ranging from personal finance modules to automated home control.

Although the report didn't mention software support, it stands to reason that the level of service will also have to rise as software becomes more sophisticated.

It seems hard to believe, but while ma-jor players in the portable computer market are falling by the wayside (i.e., Xerox and Convergent Technologies), industry analysts continue to remain

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optimistic about lapsize sales expectations.

Portable Computing Devices: The Coming Generation, a market analysis by Creative Strategies International, San Jose, CA, details the vendors to watch, the markets to sell, and the prerequisites for success in selling handheld, lapsize, and transportable computers through 1989. Some trends outlined in the report are surprising, while others merely state the obvious.

"From 1983–1989, the $2,500–$4,999 price segment will show the most rapid growth in terms of numbers shipped." This may come as a surprise to manufacturers of the $3,000 Grid Compass. The Grid hasn't done very well this year, and other industry analysts feel that consumers can't justify spending $3,000 or more for a computer you can hold in your lap. Perhaps the computer conscience will change over the next five years.

"As lapsize computers gain greater memory capability, graphics, printers, and IBM-PC compatibility, consumers will turn away from the heavier transportable computers in favor of the advantages of lapsize computers." You don't need CSI's report to learn that; IBM compatibility is generally regarded as a must for future computer generations.

For more information about the report, write to Creative Strategies International at 4340 Stevens Creek Blvd., Suite 275, San Jose CA 95129.

If the courts were to invalidate software licensing agreements, the software industry would lose 30–65 percent of its revenue over the next four years. That's according to Maureen Fleming, editor of *Download*, a newsletter published by International Research Development Inc. of Norwalk, CT. The drop in sales dollars would result not from illegally copied software, but from legitimate multiple uses of a single copy under guidelines set by the Copyright Act of 1978.

Fleming says that if publishers licensed encyclopedias the way software is licensed, you'd have to buy a set of encyclopedias for each member of your household. While the debate over software licensing rages on, Fleming's predictions about software revenues remain hypothetical: So far, no irate software buyer has challenged a licensing agreement in court. ■

Photo. CompuServe's Columbus, OH, mission control.

What Is CompuServe?

Information processing and telecommunications are buzzwords of the hour, and the CompuServe Information Service (CIS) is right in the middle of it all. You can hardly open a micro magazine without seeing mention of this on-line computer center. So what is CompuServe and and why is everybody talking about it?

CIS began in 1969 as a computer time-sharing service that provided thousands of subscribers access to a mainframe computer at a fraction of the cost of owning one. Since then, CIS has expanded its offerings to keep up with the growth in the micro industry and now serves more than 100,000 subscribers.

The Columbus, OH, company provides telecommunications networking services, electronic mail systems (e-mail), and consumer and business videotex services. The company's mainframes are located in two buildings in Columbus (see the Photo). Subscribers can access CIS via the CompuServe Network Service, a telephone system that lets users access the mainframe with a local phone call in more than 300 U.S. cities and over 42 countries worldwide.

Though CompuServe remains an important influence on business applications in the area of information management and videotex service, its Consumer Information Service is what most micro owners use. Armed with a personal computer, a terminal package, and a modem, any home computerist can tap the extensive on-line data base.

Features often used by nonbusiness computerists include the citizens band simulator, e-mail, a national bulletin board, interactive games, an on-line encyclopedia, travel and leisure resources, national news wires, and electronic magazines. CIS also provides programmers mainframe memory and storage space for projects of their own.

Many users like CompuServe's special-interest groups (SIGs), which provide a forum for information and discussion about their micros. SIGs with an emphasis on Radio Shack computers include MNET-80, the Model 100 SIG, and the TRS-80 Professional SIG. These SIGs sponsor exchanges with Tandy brass, who field questions from SIG members.

Trial subscriptions to CompuServe often come with terminal programs and modems. For more information, call CIS at 614-457-8600 or write to them at 5000 Arlington Centre Blvd., P.O. Box 20212, Columbus, OH 43220. ■

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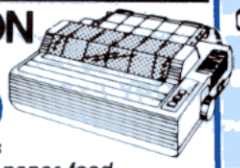

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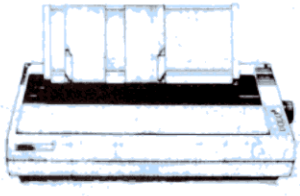

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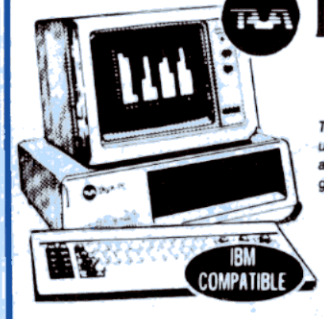

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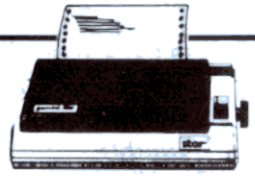

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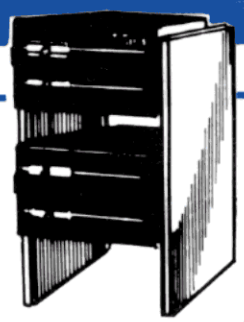

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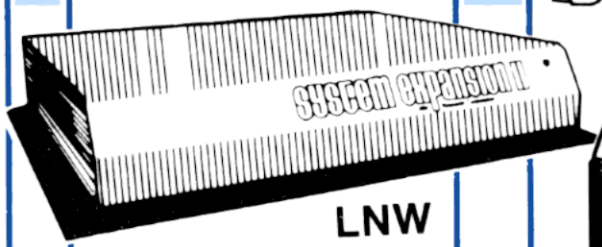

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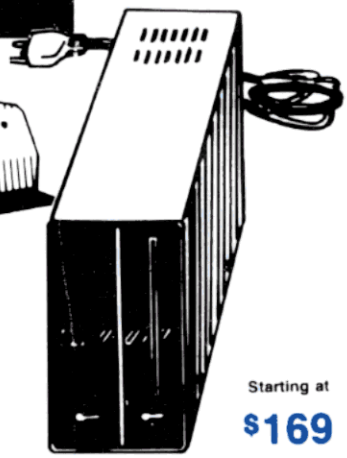

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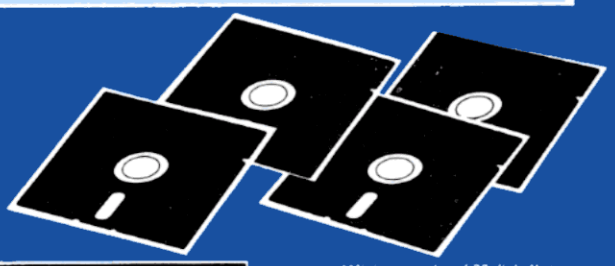

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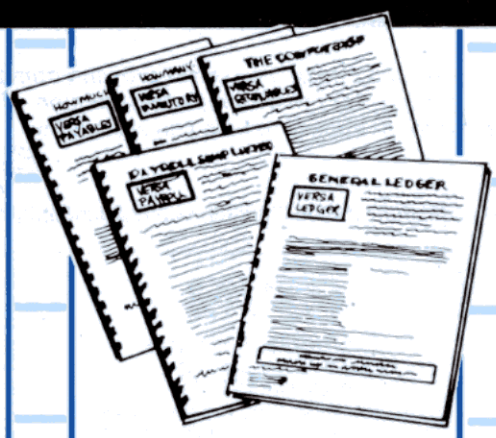

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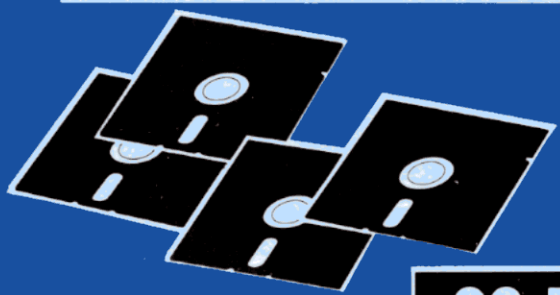

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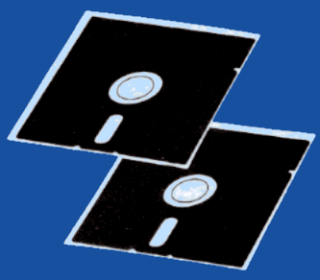

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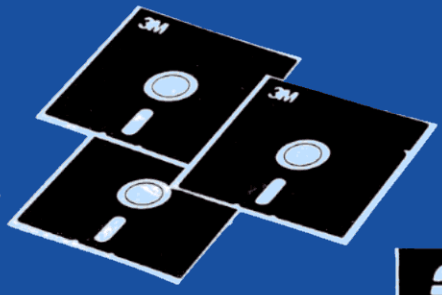

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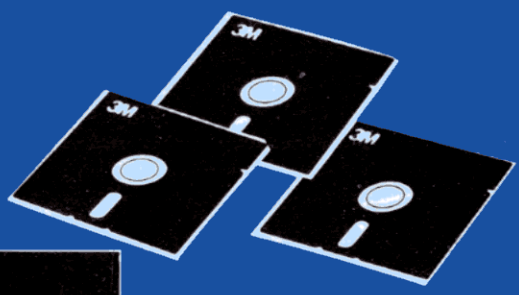

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Part of the Game

Bomber ("Bombs Away!," August 1984, p. 74) is, in my opinion, one of the finest games ever to hit the pages of *80 Micro*. However, the chopper sound wouldn't work on my Model III. With a few minor changes, I've rectified the problem. Don't delete lines 9690–9710; instead, add:

```
09705   IN    A,(0ECH)
13655   DI
```

Change the following lines:

```
03020   IN    A,(0E0H)
03030   IN    A,(0ECH)
```

and delete 03040 and 03050. If you prefer the nifty Model III rocketship character to the left bracket for the program's rockets, change the 91s to 255s in lines 4740, 5700, 5860, and 7300.

Sanford F. Kaplan
4390 Silsby Road
University Heights, OH 44118

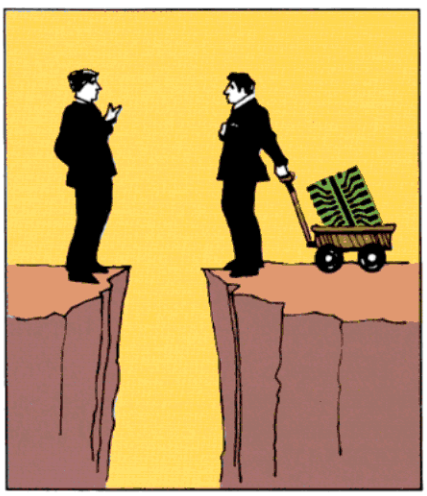
Assembly Line

A word of thanks to Douglas Payne for his EDTASM4 program (August 1984, p. 43). I've made a small change to prevent accidentally loading EDTASM instead of EDTASM4, which can happen if you're used to loading the Model III program, and which scrambles the computer's memory, forcing a reset. To modify the program, change line 860 to read:

```
00860 EADCB: DEFM 'EDTASM/CMD.PASSWORD
```

Then use TRSDOS 6.X.X's ATTRIB command to assign "Password" to EDTASM/CMD after you've converted it to Model 4 format. With the change in place, you get an illegal attempt error instead of a scrambled memory.

Sid Williamson
432 Berford St.
Wiarton, Ont., Canada N0H 2T0



Leisurely Scroll

If you have the graphics board for the Tandy 2000, scrolling is unacceptably slow when you program in Basic. To solve the problem, you can tap the F12 key when you boot up the system, which tricks the computer into thinking you don't have the graphics board installed. However, when you use graphics, the computer switches back to the graphics screen in Basic. If this happens, you can use a short Basic program (see the Program Listing) to switch the computer to the text mode. I've found it useful to save the program as Text.BAS; whenever I program in Basic I type in BASIC TEXT. This automatically puts the computer in Basic with a fast scroll.

Scott Trent
11017 W. Copeland Ave.
Hales Corners, WI 53130

```
  5  REM  Copyright 1984 Scott R. Trent
  7  REM
 10  TEXT=&HFFF0
 20  DATA &HB0,&H02       :REM MOV     AL,2
 30  DATA &HB4,&H00       :REM MOV     AH,0
 40  DATA &HCD,&H10       :REM INT     10H
 50  DATA &HCA,&H00,&H00  :REM RET     0
 60  FOR LOCATION=TEXT TO TEXT+8
 70  READ BYTE
 80  POKE LOCATION,BYTE
 90  NEXT LOCATION
100  CALL TEXT
110  COLOR 2
120  NEW
```

Program Listing. Fast scroll for the Model 2000 in Basic.

Speech! Speech!

Model 4 owners can use Theodore M. Diament's Model III speech synthesizer by making two changes to the Program Listing ("Sound Software," October 1984, p. 100). Since the 4's cassette port differs from that of the Model III, you should change lines 580 and 590 to:

```
00580   DEFW    0000H
00590   RRA
```

With these changes in place, the program examines only the cassette input bit and ignores all other bits at the cassette port.

Mark D. Goodwin
HCR 79, Box 103
Orland, ME 04472

Help File

I own a DAK/Olivetti PR-2300 printer and I need a driver for printing graphics. I'm using the Tandy 2000 with Practical Peripherals' IBM PC driver—it loads and runs, but nothing happens. Apparently it's not written in MS-DOS 2.0, the operating system I'm using. I'm also looking for a patch to WordStar that enables the print commands to the PR-2300.

Jim Blyler
1554 Kildare Way
Pinole, CA 94564

I use my Model III for simulation programs that use the RND random number function. The TRSDOS *Disk System Owner's Manual* states that the seed for this function isn't accessible to the user, meaning it's not possible to duplicate a sequence of pseudo-random numbers. To circumvent this, I've tried several techniques, including storing a series of random numbers in a sequential file. Does anyone know of a POKE address that I can use to reseed the random number generator?

Bob Barringer
6614 Vollmer Lane
Godfrey, IL 62035

Scanned by Ira Goldklang - www.trs-80.com

I have the Radio Shack high-resolution graphics board on my 48K Model III. I'm looking for programs, subroutines, arcade games, etc. that use hi-res graphics.

Rick A. Harris
3213 Shelter Cove Ave.
Davis, CA 95616

Can anyone help me find a driver program for a Spinwriter 5520 KSR printer interfaced with a 48K Model I through the RS-232C port? The Spinwriter is a rare machine among micro users in this country.

Dr. Maxwell J. Carter
39 Gunnersbury Ave.
Ealing, W5 3XD
London, England

Can anyone tell me where to get software for the Radio Shack digitizer? I'm particularly interested in calculating areas and storing the results.

Chuck Reed
P.O. Box 1682
Rock Springs, WY 82901

Can SuperScripsit be zapped (using NEWDOS80/VZ Superzap) to eliminate the feature that limits document size to about 137 grans? I want to take advantage of my Model III double-sided drives. Also, is there a way to transfer Model III SuperScripsit files to Model 4 SuperScripsit?

J. Robert Menzies
7176 N. 4th St.
Coeur d'Alene, ID 83814

I'd like to buy the following out-of-print back issues of *80 Micro*: February 1980, April 1980, July 1980, February 1981, and April 1981.

T. K. Nilsson
27 Doveton Ave.
Doveton 3177, Victoria
Australia

Does anybody have patches to Profile III+ and/or SuperScripsit so they'll run under NEWDOS80 2.0 or LDOS 5.13?

Patrick Potin
4 Ave. Herbillon
94160 St. Mande France

I have a Model II/16 and would like to contact anybody who has developed computer-assisted design software that I could use.

Gary J. Evans
1 Rambler Lane
Slough, Berks SL3 7RR, England

Error Trap

In "Drawing Boards" (July 1984, p. 65), the command for returning to DOS is incorrect. Type in EN; don't press the enter key as indicated in the article.

—Eds.

An omission from my sidebar about formatting a Model 4 hard disk (August 1984, p. 27) prevents the technique from working properly. In the second step, after you press the break key and the five-line patch goes to disk, type in from the DOS level:

```
PATCH INITHD3/JCL USING INITHD3
```

and then continue to follow the printed instructions. By the way, this

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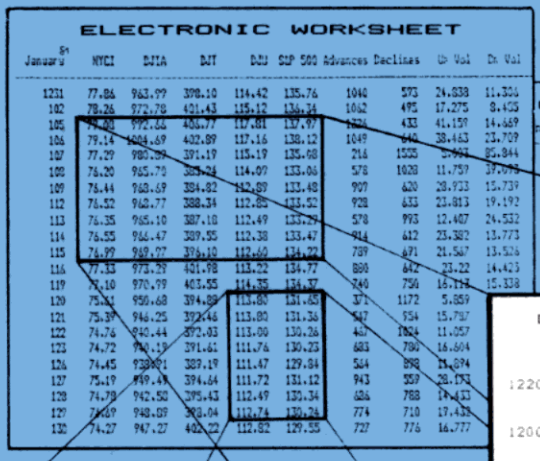

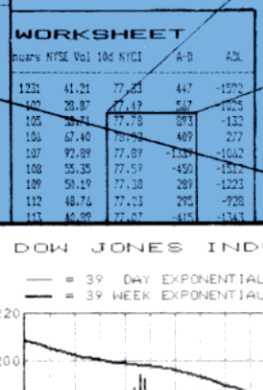

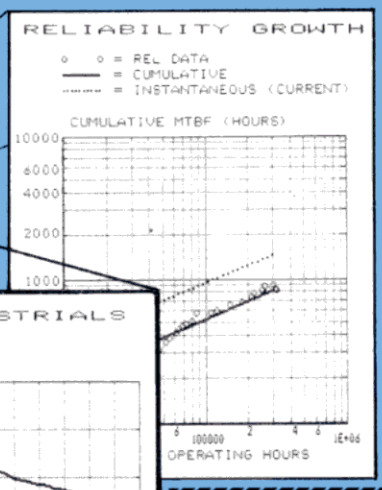

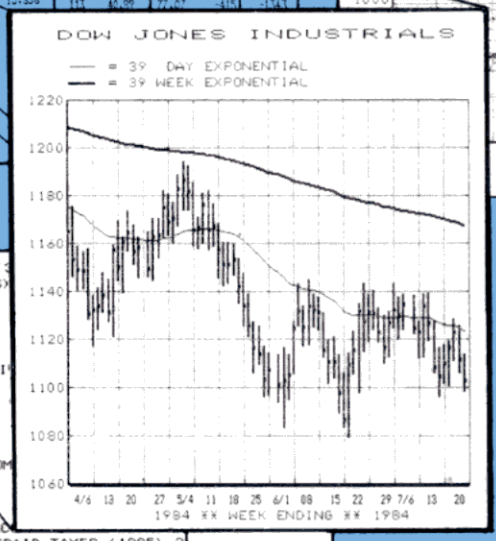

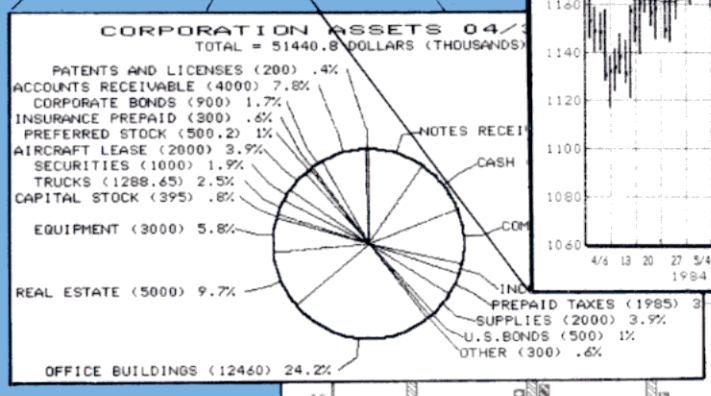

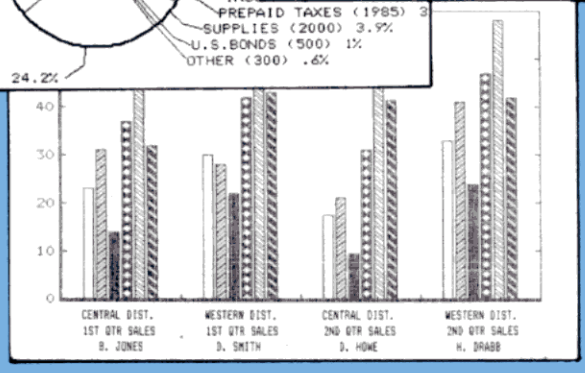

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procedure works only with the 5-megabyte Tandy drive. The coding is different for the 15-meg drive and for other brands. Readers can contact us about using the method on other hard-drive systems.

Dennis Brent
Powersoft
11500 Stemmons Freeway
Suite 125
Dallas, TX 75229

80 Micro's New Products section for September 1984 (p. 188) referred to our new math learning program as Arith-Magic, which is an older product still on the market. The new program is Arith-Magic II.

Janet Regnell
Quality Educational Designs Inc.
P.O. Box 12486
Portland, OR 97212

User's Groups

TRS-80 Users Group of Central CT
P.O. Box 1575
Hartford, CT 06144
Contact: Armand Korzenik

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Sysops: Matt Baker and Ron Clayton

DEBUG

I let a bug slip into my sales report generator ("For Sales," August 1984, p. 142). Readers should change line 1100 to read:

```
1100 PRINT "OK";:INPUTOK$: IF OK$ =
"NO"THEN Z = Z - F(I):W = W - E(I):E(I) =
E(I - 1):F(I) = F(I) - F(I - 1):Y(I) = Y(I) - Y
(I - 1):I = I - 1
```

This steps back the amounts in your sales and commission columns when you answer no to the "Is data OK?" prompt.

Glen E. Sparks
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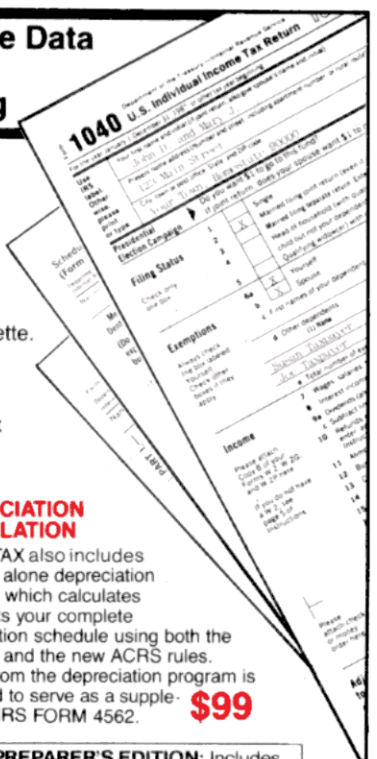

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Making Conversation: The VS-100

by Gary A. Ludwick

edited by Ryan Davis-Wright

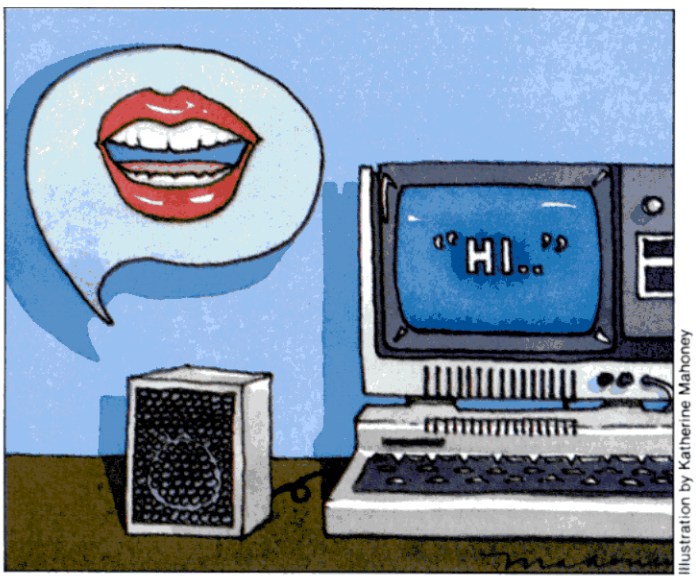

Illustration by Katherine Mahoney

If you're an avid reader of *80 Micro*, chances are you've seen an ad for a $69.95 voice synthesizer from Alpha Products. You might have wondered just how good it could be for such a low price. Well, the VS-100 does everything that Alpha claims it does, and does it surprisingly well. While it has some shortcomings, the VS-100 does an admirable job of synthesizing human speech.

The VS-100 is a compact 3- by 5-inch circuit card that plugs into either the Model I expansion port or the Model III's 50-pin I/O bus. To install it, you simply plug it in and attach the volume control knob. Power is supplied by a regulated transformer wall plug that goes to the nearest 110 volt outlet.

The only other step is to connect a speaker. Since the VS-100 contains its own amplifier, any small speaker will do. But for only $5.95, Alpha Products will supply you with one. This well-designed little speaker comes with the correct miniplug for the circuit board and it's all you really need.

The VS-100 is built around the Votrax SC-01 phoneme synthesizer. A phoneme is a basic unit of speech, a sound like "th" or "ch" or "ee." The English language has about 64 such units and the Votrax can speak them all.

Fortunately, you don't have to know anything about phonemes or their computer codes to make the VS-100 work. The Talker 2.0 software takes care of that.

The real impact of the VS-100 comes with its pairing to the Talker 2.0. While the hardware is affordable by almost everbody, the software makes it usable for even a beginner.

Before you start to make it speak, you need to understand that the Talker is designed primarily to work with Basic programs. It works under all DOSes and some machine-language programs, but if you're looking forward to a talking word processor, you might be disappointed.

How It Works

Talker comes with a wide range of choices and parameters for setting up the VS-100 (see Table 1 for a command synopsis). You can command Talker to automatically speak each word entered from the keyboard (keyboard echo) or each word that appears on the video screen (video echo). It can pronounce each letter or punctuation mark, and you can select the pitch of the voice and the speed of the delivery.

Also, you can set aside a speech buffer that will feed the phoneme codes to the VS-100 as fast as it can receive them without slowing down the computer functions. Up to 10K is reservable for this purpose, which works out to about 20 minutes of speech.

All of the control codes are sent to Talker when it is loaded from DOS Ready. For instance, "TALKER15/VW//BY//1" would load Talker into highest available memory, set aside a 4K buffer (15 x 256 bytes), suppress duplicate blanks to speed up speech delivery, and set the pitch to 1, a male voice. Every control code can also be embedded in your Basic program to change parameters or inflection whenever desired.

After you've loaded Talker, set the initial parameters, and entered Basic, you're now ready to make it speak. If you're writing a program, and the keyboard or video echo option is on, every word that you type will be spoken. Or, loading an existing program into Basic (with the video echo on) makes every word that appears on screen spoken automatically. This is a mixed blessing, however.

The main problem, of course, is that most people read faster than the VS-100 can talk. And with the speech buffer, the computer will keep on going while the VS-100 lags a screen or two behind. This can drive you crazy in short order.

If you want to cancel this, pressing the shift and space keys together will clear the buffer and bring the VS-100 to where you are currently on screen.

After five minutes trying to automatically use speech in a text adventure

game, I realized that the constant electronic chatter of the video echo option might be the easiest, but not the most satisfying, way to make the VS-100 work.

Converting an Existing Program

One other feature of Talker implements two Basic commands: Print* and Print!. Change any Basic print statement to Print* and the line within quotes that follows will be spoken, but not printed on the screen. Use Print! and the line will be spoken and printed.

The secret to effective computer-generated speech lies in the judicious use of these two statements. You have to know when to make the computer talk and when to let the user read the screen. It takes some trial and error to achieve the best mix of talking and silence, but you will quickly learn that computers (like humans) are more interesting when they occasionally keep quiet.

For those with a good word processor, the task is even simpler. Just load in your Basic program as a text file and use a global Find and Replace command to locate each print statement in your program. If it looks like something you want spoken, hit the replace key to change the statement to Print* or Print!.

VS-100
Voice Synthesizer and Talker 2.0 Software

★★★★½

Alpha Products
79-04 Jamaica Ave.
Woodhaven, NY 11421
718-296-5916
Models I, III, 4P,
and Color Computer
VS-100 $69.95
Talker 2.0 disk $29.95
Talker 1.4 (not reviewed)
cassette and disk $19.95

Easy to use?	★★★★★
Good docs?	★★★★½
Bug free?	★★★★☆
Does the job?	★★★★★

Writing Your Own Talking Program

In addition, the Talker offers a convenient editor and speech/text generator. It allows you to create your own spoken phrases as subroutines.

Figure 1 is what you see on the VSEDIT screen. What is at the top is not garbage, but really the phoneme construction of the phrase, "A big hello to *80 Micro* readers." At the bottom of the screen are the commands that allow you to manipulate and fine-tune the phrase. Each of the periods represents an inflection or pitch code, and each of the PA groupings represents pauses of various lengths.

Because the VS-100 is not 100 percent perfect in its pronunciation, you will always have some tweaking to do in your sentence construction. For example, it can't distinguish between read (present tense) and read (past tense). To pronounce it correctly in the past tense, it must be typed in phonetically: "I have red this book." Reading would have to be spelled reeding, and so on. You must be conscious of the way words are spoken, as opposed to the way they are spelled.

With VSEDIT, you can type in a phrase, listen to it spoken, and then fine-tune the pronunciation and the inflection. If you've written a question, you would want to make the inflection rise at the end of the sentence for a more realistic-sounding phrase.

When you have the text/speech just the way you want it, it can be saved to disk as a line-numbered subroutine. Then reference those lines in your program each time you want the machine to talk. When these subroutines are merged back into your finished program, they even come complete with the return statement built in.

Good but Not Perfect

Before the quibbling begins, I must note that the package of the VS-100 and Talker 2.0 is an excellent bargain.

KL	Keyboard echo by letter
KW	Keyboard echo by word
KN	Keyboard echo off
VL	Video echo by letter
VW	Video echo by word
VN	Video echo off
DP	Delivery proportional
Dx	"x" is A (fastest) to N (slowest)
SY	Spell on
SN	Spell off
PN	Punctuation ignored
PY	Punctuation said
MY	Math operands said
MN	Math operands not said
BN	All spaces are pauses
BY	Duplicate blanks ignored, single blanks shortened
/1/	Lowest pitch (male)
/2/	Regular pitch
/3/	Higher pitch
/4/	Highest pitch (female)
QY	Quiet on
QN	Quiet off

Table 1. Talker 2.0 command synopsis.

But there are some things that it just won't do. Because many machine-language programs use their own keyboard and video drivers, the echo option sometimes doesn't function. That leaves word processors like Scripsit and Lazywriter speechless.

You may also have some problems with Basic programs that use high memory for their own purposes. The manual (36 pages on the VS-100 and 12 pages on the Talker 2.0) gives you some suggestions for handling this, but doesn't go into detail.

According to Alpha Products, you first load your high-memory program into Basic, come out to DOS Ready with a CMD"S to load Talker, then go back to Basic with a Basic * command (the Basic * command returns you to your location in Basic without resetting anything). Since Talker is self-relocatable, it will take the highest memory still remaining.

```
.UH2  .UH3  .PA1  .B   .I   .G   .PA1  .H   .EH  .L   .PA1
.L    .01   .U1   .PA1 .T   .IU  .U    .PA1 .A2  .A2  .Y
.T    .Y    .PA1  .M   .AH  .E1  .PA1  .K   .R   .O1  .U1
.PA1  .R    .E    .D   .ER  .Z   .PA1  PA0
```

Arrows—move cursor
A—add phoneme
<ENTER>—say all
shift [—inflection
I—insert words
D—delete phoneme
S—say word
*—save subroutine
R—remove word
C—change phoneme
K—clear all
?—recall from DISK

Figure 1. The Talker 2.0 VSEDIT screen.

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- Assign **any sequence of keystrokes** to a **single** control key.
- Call up to 16 **HELP screens** at any time.
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But it doesn't always work. Sometimes there is no speech (with Video Echo engaged), or only part of the screen display is spoken. And sometimes the whole program crashes.

The experts at Alpha Products could probably tell me what was wrong, but technical support is only available by mail.

Conclusions

All things considered, the VS-100 and Talker 2.0 are a major accomplishment for such a low price. No one who heard my computer talk could resist typing in their own phrases and messages. That is how we found that several popular off-color phrases and words had been bleeped out by the software designers.

While the manual is well done, I wish it had gone into more detail about integrating Talker with some high-memory programs.

The speech is usually very clear and distinct with a bit of an accent. But the clarity of speech is directly proportional to the amount of fine tuning you do within your programs. In the automatic screen or keyboard echo mode, a 10–15 percent mispronunciation rate seems to be about par.

The VS-100 and software are a fascinating system with experimental and practical applications just now being explored. While it may not be a necessity, it would be hard to find more value and fun for $106. ■

Pascal in the Fast Lane

by Alan Neibauer

The Turbo Pascal compiler is a steal at $49.95. It compiles source code extremely fast (well-deserving of its Turbo name) and has extensions and refinements to Pascal that make it a complete software development tool. Even with the refinements, the syntax adheres closely to standard Pascal, so programmers will have no trouble using it.

Unfortunately, Turbo can only be used by CP/M and MS-DOS users, not TRSDOS diehards. Formats are available for the Model 2000, Model III owners with CP/M cards installed, and Model 4 users with either Radio Shack's or Montezuma Micro's CP/M.

No one who heard my computer talk could resist typing in their own messages.

Turbo Language

Turbo supports almost all the Jensen and Wirth standards, including pointers and variant records. I've used it to run a number of programs from standard Pascal texts with no editing necessary. The only items not included in the language are:

- *Dispose.* Use Mark and Release instead.
- *Packed Variables.* Turbo uses packing automatically whenever possible. The reserved word packed will be accepted by the compiler, but with no effect.
- *Page Procedure.*
- *Procedural Parameters.* Procedures and parameters cannot be passed as parameters.
- *Get and Put.* All I/O functions can be handled with extended Read and Write procedures. According to Borland, this speeds up I/O and reduces overhead.

Turbo Pascal

★ ★ ★ ★ ★

Borland International
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Easy to use?	★★★★☆
Good docs?	★★★★★
Bug free?	★★★★★
Does the job?	★★★★★

The extensions to standard Pascal are what make Turbo outstanding. In fact, most UCSD programs will run under Turbo with little or no editing.

A complete set of dynamic strings is available and you can assign, concatenate, and test them with the normal relational operators. You can identify a variable as of type string(n), with n being the maximum string length. String arrays, both single and multidimensional, are possible through Type or Record.

In addition, string procedures include Delete (removes a substring), Insert (adds a substring), STR (conversion from integer or real to string), and VAL (converts from string to either type integer or real).

String functions include Copy (returns a substring), CONCAT (combines strings and substrings), Length (like the Basic LEN), and POS (similar to instring).

Turbo also provides full file-handling facilities including Seek to allow random access. You can treat external devices like text files and access them through the preassigned files CON:, TRM:, KBD:, LST:, AUX:, and USR:. Outputting to the line printer, for example, is as simple as including the LST: external device name in the write procedure: Write (LST:, "Turbo Pascal").

No special files need to be assigned, and the EOF, FILEPOS, and Filesize functions are also included.

When set for your terminal, Turbo offers a number of screen function procedures, such as high and low video, GOTOXY, CLREOL, and CLRSCR. For direct memory manipulation, Move performs a mass copy of a specified number of bytes, and FILLCHAR fills any range of memory with a specific value. Random number generation is also supported through Randomize, Random, and Random(I).

For the more adventurous programmer, Turbo provides absolute address variables, Chain and Execute commands, Include files, and in-line machine code. Procedures and functions are given to directly access CP/M or MS-DOS BDOS and BIOS functions and to write your own I/O drivers.

Compiler Directives

Many of Turbo's features are controlled by compiler directives that you

can set. Each directive has a default value and can be ignored by the inexperienced programmer.

Changing a default value involves including a dollar sign and the directive somewhere in the source code. This makes it easy to change system parameters for optimized code. A summary of the directives is given in Fig. 2.

The Turbo Menu

Turbo is menu-driven and includes its own WordStar-like editor. Menu options comprise the following: edit, work file, main file, compile, run, execute, save, directory, logged disk, compiler options, and quit. Selecting the edit menu option will ask you for the name of the work file then place you in the editor. If the work file is on disk, the code will be loaded and displayed.

The work file contains the current source code. You use a main file only when working with programs using the $I compiler directive to include files. You can load both the work and main files through the menu options.

You compile the current work file with the C option. You can run the work file by either compiling it first and giving the R command, or selecting R initially. If a compiled program is not already in memory, the current work file will first be compiled, then executed.

Other programs on your disk can be run from within Turbo through the X option. Save, DIR, and Logged Disk will write your code to disk, display the disk directory, and change to another disk drive.

You use the compiler Options command to select the type of compiled code desired. Normally, code is compiled to memory and can be run only from within Turbo itself. This provides maximum efficiency while writing and debugging a program. Through the compiler options, however, you can instruct Turbo to save the compiled p-code to disk, making it an executable .COM file from the operating system, or use it to create chain files.

Unfortunately, chaining files is one of Turbo's awkward features. To chain or execute files, you must assign code, data, and stack space. If not done properly, chaining will result in an out-of-memory error message. While this is explained in the manual, the instructions are not sufficient to prevent you from trial-and-error experimentation.

The Turbo Editor

The built-in Turbo editor obeys almost all of WordStar's command keystrokes. Some minor improvements have been incorporated to increase its efficiency as a source code editor. A single word can be marked as a block (control-K, control-T) and a line restore command (control-Q, control-L) has been added to restore an edited line to its original contents as long as the cursor has not left the line. While no fixed tabs are provided, an auto-indentation feature will automatically indent the start of each line to the starting position of the line above. This makes the indentation common in Pascal programs much simpler.

Operation

The compiler is where Turbo earns its name. Over 2,000 lines of p-code can be compiled per minute when it's compiling to memory. And it only takes a few seconds longer when compiling to disk. After years of teaching UCSD Pascal, Fortran, and Cobol on a variety of machines, I was amazed at how fast it was.

When the compiler encounters an error, the error number (or full message if you loaded the message file) will appear. While the messages are clear and concise, they are also more fully explained in the manual. For the exact source line error, ESC will display it and put you in the edit mode. Correct the error and repeat the process.

Several Pascal compilers have this feature and it can be a mixed blessing. First, you have no idea how many errors there are until they are all corrected. Second, some programmers appreciate receiving a program listing with all of their error flags and warnings. The list can then be examined away from the computer.

Turbo's method would be useless if it took a long time to compile the programs. You really don't want to wait 30 minutes for it to find an error. But Turbo is almost as fast as interpretive Basic's error checking.

Also, a minor error in the declaration section may cause any number of errors later in the code. By fixing the early error, you can sometimes clear up later ones. This is true of other languages besides Pascal.

B When active, standard input and output files are :CON.
C When active, control-C and control-S are obeyed during console I/O.
I When active, all I/O operations are checked for error. When followed by a file name, instructs the compiler to include a file during compilation.
R When nonactive, array indexing is not checked.
V When active, type checking is performed.
U When nonactive, control-C will not interrupt program execution.
X When active, code generation of arrays is optimized.
A For CP/M only, when active nonrecursive code is generated.
W For CP/M only, controls level of nesting allowed on "with" statements. Default is two.
K For MS-DOS only, when active stack space is checked for adequate room.

Figure 2. Compiler directives (default settings).

Turbo Programs

Along with Turbo.COM, the distribution disk includes a number of auxiliary programs. The error message file, TURBOMSG.OVR, is pure ASCII, and can be edited or translated into other languages with the editor or any word processor. TLIST.COM, a source code listing program, will print your code with line numbers and key words underlined. Since the source files are also ASCII, the system Control-P, Type or Print could also be used for printing your code.

To install Turbo for specific terminals, you use TINST.COM and TINST.DAT. A wide number of terminals are available from a TINST. You can change the editor commands with TINST, redefining the arrow or function keys for often used keystrokes.

Other files include Turbo.OVR, needed to run Pascal .COM files under CP/M-80; Error.DOK, which comprises some useful notes from the folks at Borland; and a spreadsheet program written entirely in Turbo Pascal. For a good lesson in Pascal programming techniques, examine this, run it, and then compile it. It's nothing fancy but it's a good demonstration.

The Manual

The 250-page bound manual provides a good explanation of most aspects of Turbo, except for the lack of coverage of chaining files. While it will not serve as a Pascal text editor (nor should it), the manual covers all the bases of Pascal, including more advanced topics regarding CP/M and MS-DOS implementations.

Conclusion

I've used Turbo on three different computers: a Model III, and 8- and 16-bit Zeniths. It performed flawlessly. As a programming teacher, I have to judge software critically (especially language compilers). I want my students to spend their time learning programming, not the intricacies of a particular compiler.

Turbo is easy to use and an absolute marvel at compiling code. It is a fine programming and educational tool, and a good bargain to boot. I recommend it for both the beginning and advanced Pascal programmer. ■

C Sophistication From Manx

by John B. Harrell III

I've had a lot of experience with different C compilers, but the Aztec C80 Compiler and Professional Development System is the best I've seen. It's a full implementation of C in its purest form. It faithfully supports the standards set forth for C and so produces easily portable code. If you're interested in an excellent programming language and a powerful tool for software development, the Aztec C80 system is an obvious choice.

What's Inside

The software package contains three disks and the documentation. The disks (all two-sided flippy disks) contain the compiler software and the additional features of the development system. They all come in double-density TRSDOS 6.X-format (or whatever is applicable for your system), but don't provide an operating system itself. Figure 3 lists the disk files and gives a brief description of each.

The major system components are the C80 compiler, relocatable assembler (AS), linkage editor (LN), object file librarian (LIBUTIL), DOS loader format generator (CV), and text editor (VED). The disk also contains several libraries of object modules that generate code in different ways and other features, including a powerful program text editor (Z).

Perhaps the most important part of the Aztec system is the tutorial included in the documentation—it's a must for learning the system, since the going can get a bit rough. For instance, while Aztec provides examples on how to configure your working disks, I had to spend an appreciable amount of time just building and laying them out. The software doesn't make it easy for a first-time user and I felt it was unnecessarily complicated.

Furthermore, Aztec distributes many of its standard header files in archive files you can't easily access. And you need these header files to access many of the system's functions. I spent a considerable amount of time reading the manual before I discovered the write-up on ARCV, the archive manager.

The Text Editor

Manx provides two vehicles for text editing: VED and Z. While VED is very fast, it's limited to the cursory functions of moving through the file, searching, and entering text. Z, on the other hand, provides all the features you need in a text editor.

I appreciated VED's simplicity. It provides the basic functions needed to enter a program and change it, while being easy to use. To top it off, you get VED's complete source code in an archive file; industrious programmers can easily change it to suit their tastes.

If you aren't satisfied with the limitations of VED, the Z editor should take care of your needs. This is a program text editor patterned after the Berkeley Unix editor VI. Having the capabilities of a full Unix text editor

Continued on p. 168

Files in Standard System

File Name	Description
C80/CMD	Aztec C compiler
AS/CMD	8080 relocating assembler
LN/CMD	Linkage editor
CV/CMD	TRSDOS load image generator
LIBUTIL/CMD	Object file librarian
ARCV/CMD	Source archive unpacker
VED/CMD	VED text editor
VED/ARC	VED source file archive
C/LIB	Library of non-floating point functions
M/LIB	Library of floating point functions (Model 4 only)
T/LIB	Tiny library
R/LIB, R/CMD	Fast linking library and loader
MR/LIB, MR/CMD	Fast linking library and loader (floating point)
HEADER/ARC	Source archive of header files
EXAMPL/C	Sample C program
Z/CMD	Full-screen editor (similar to Unix VI editor)
OVBGN/O, OVLOADER/O	Overlay support functions

Files in the Pro Extension

File Name	Description
LIBCSRC/ARC	Source archive for C functions
LIBASRC/ARC	Source archive for assembler functions
TRS4SRC/ARC	Source archive for Model 4 functions
TRS3SRC/ARC	Source archive for Model III functions
MATHSRC/ARC	Source archive for math functions
TINYSRC/ARC	Source archive for tiny functions
OVLY/ARC HX/ARC	Source archive for overlay and fast linker

Figure 3. Aztec C80 disk files.

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TASMON Monitor	(29.95)	$ 24.50
MODEM80 Terminal	(39.95)	$ 34.50
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1

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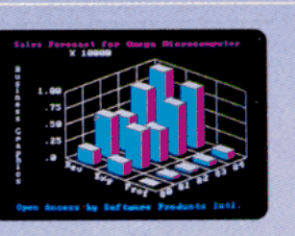

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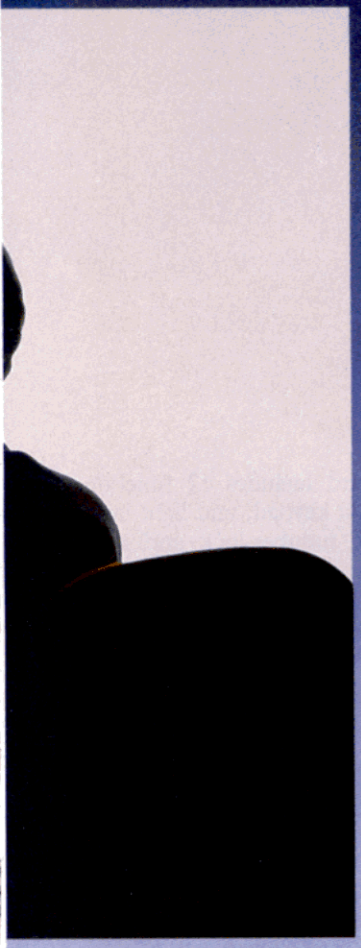

Because they do not have a dedicated relational data-base manager that can quickly direct massive amounts of data, other programs simply can't do what OPEN ACCESS can. Some don't have a communications program, others no dedicated word processor. None have a time management program.

There's just one conclusion: At $595, OPEN ACCESS can do more for you than any other comparable business program on the market. Bar none. But the only way for you to be convinced is for you to see OPEN ACCESS work its magic on your work load. So call your local software dealer today, or call us at SPI, at 619-450-1526.

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The Tandy 1000 A TRUE-BLUE Compatible

by Eric Maloney

Tandy's Model 1000 may lack technological innovation, but it gives you IBM PC compatibility for $1,199.

Executives at Tandy cringe at the term "IBM compatible," but that's what the new Model 1000 is—a copy of the IBM PC, with few surprises or enhancements. Nevertheless, the machine's price tag should startle a few people. And if the machine's quality is up to Tandy's usual standards, small businesses and serious home users should find it attractive.

Start with the base price of $1,199. You get a 128K system with one drive, a 90-key detachable keyboard, MS-DOS and GW-Basic, a sound generator, three expansion slots, and a parallel interface. Add a color monitor and 128K RAM upgrade, and the price goes up to $2,048.90. Throw in a second drive, and the cost is $2,348.85. (See Table 1 for a rundown of the Model 1000's features, and Table 2 for a price list.)

By comparison, a one-drive IBM PC with 256K, color adapter and monitor, printer adapter, DOS, and Basic goes for about $3,063. A PC with a second drive costs about $3,488.

A two-drive Tandy system, then, costs close to $1150 less than a comparable PC. Or, to put it another way, you get a PC for the price of a PCjr.

But how compatible is compatible? According to Tandy executives, about 95 percent. Which means that most IBM PC software should run on the 1000 as-is, and that many IBM PC expansion cards should work with the 1000's expansion bus.

The Hardware

The Model 1000 looks like a scaled-down Model 2000, with the same textured white plastic casing. The keyboard is identical to that of the Model 2000's. The drive unit includes one or two 5¼-inch disk drives mounted horizontally on the right side of the unit; the reset button and two joystick ports are on the left. The on/off switch is on the right side panel. And following in the 2000's footsteps, the 1000's name plate lacks the Radio Shack logo—it's labeled the Tandy 1000 Personal Computer.

Like the IBM PC, the 1000 uses an 8088 microprocessor, which features a 16-bit internal architecture, 8-bit bus, and 4.77 MHz clock rate. You can expand internal memory to 640K, the first 128K on an expansion card and the remaining RAM on a second card. The first card also includes a direct memory address (DMA) module, which speeds up the 1000's execution speed.

The keyboard includes 12 function keys, a numeric keypad, and light indicators for the number-lock and caps keys (see Photo 1).

Tandy sells as options a 12-inch high-resolution green-screen monitor and a 13-inch high-resolution color monitor. You can, however, use any RGB monitor, including the one IBM sells for the PC. (The 2000's monitors, on the other hand, are incompatible with the 1000.) In addition, you can connect the 1000 to a TV set with an RF modulator.

Screen format is either 40 or 80 characters by 25 lines. In graphics mode, the 1000 has three resolutions: 192- by 200-pixel, 320- by 200-pixel, and 640- by 200-pixel. You can also choose from up to 16 colors for display, and the monochrome monitor features blinking, reverse video, highlighting, and shades of gray (See Photo 2).

Editor's note: This article is not a review of the Model 1000, but a preview based on material provided by Tandy and an early look at prototype units. 80 Micro *will run a complete review of the system in a future issue.*

Photograph by Edward Judice

Photo 1. The Model 1000 keyboard sports 12 function keys, a numeric keypad, and light indicators for the number-lock and caps keys. *Photograph by Edward Judice*

CPU	8-/16-bit Intel 8088
Internal memory (standard)	128K
Internal memory (maximum)	640K
Disk drives	1
Disk storage	360K
Speed	4.77 MHz
Operating system	MS-DOS
Expansion slots	3, IBM compatible
Graphics options:	
Low-res	160 by 200
Medium-res	320 by 200
Hi-res	640 by 200
Color (maximum)	16
Sound generator	TI SN76489A
External connections	2 joystick ports
	Light pen port
	Parallel port
	Audio output jack
	TV interface
Other	Mono, color graphics adapters
	TV interface
	Speaker
Options:	Second drive
	12-inch hi-res mono monitor
	13-inch hi-res color monitor
	RF modulator
	300-baud direct-connect modem
	RS-232 interface
	TRS-80 touch pad

Table 1. The Model 1000 in a nutshell.

The drives are double-sided, double-density, 40-track half-heights, and will read IBM-formatted disks. While the system won't accommodate an internal hard drive, Tandy will sell a hard disk interface board.

For sound, Tandy chose the SN76489A chip from Texas Instruments. It contains three programmable tone generators, each with its own programmable attenuator, and a noise source, also with an attenuator. The generator is compatible with the PCjr's SN76496N chip.

The expansion slots are in the rear of the drive unit on the right-hand side (see Photo 3). Tandy says that the slots will accept most cards designed for the IBM PC, provided they're no longer than 10 inches. In addition to memory and hard disk boards, Tandy will offer as options a 300-baud direct-connect modem board, an RS-232 board, and a network board.

Finally, the Model 1000 includes parallel printer and light pen interfaces and an audio output jack, all in the rear.

Software and Compatibility

Tandy's initial software offerings target three main markets—business, education, and entertainment. Table 3 lists the software titles scheduled for release with the machine.

In addition, Tandy is bundling a multipurpose business program, called DeskMate, with each Model 1000. DeskMate includes six main applications: Text, Worksheet, Filer, Calendar, Telecom, and Mail. The software also allows remote access to Mail and DeskMate files (see the sidebar for a detailed description).

Tandy officials are a bit uncomfortable when discussing available software. Naturally, they'd like customers to buy from Radio Shack. But one of the major selling points of the Model 1000 is its IBM compatibility. Owners can presumably run IBM packages off the shelf, a shelf that could very well line the wall of a competing retailer. It will be interesting to see whether Tandy can promote the 1000's compatibility without cutting into its own software sales.

Compatibility will undoubtedly be a major concern of potential Model 1000 buyers, particularly after the Model 2000's limitations. As an out-and-out IBM PC clone, the 1000 will run many more IBM packages, but it still won't run all of them.

Perhaps the biggest stumbling block to compatibility will be memory con-

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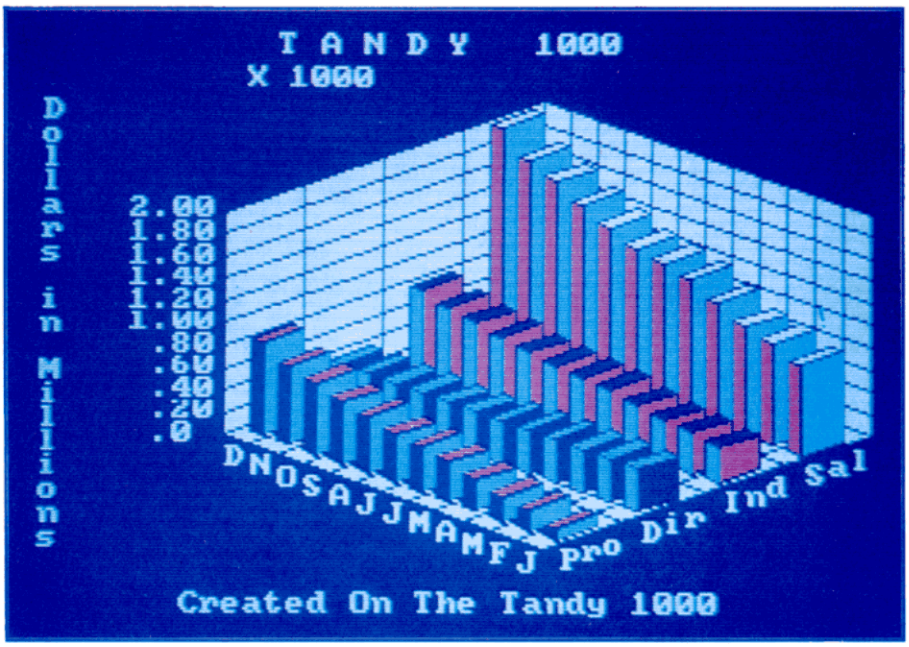

Photo 2. Screen shot of the Model 1000's 3-D graphics. Photograph by Edward Judice

straint. The video graphics memory takes 16K or 32K of RAM, and GW-Basic will take another 25K, thus reducing the room for applications programs. Says the *Software Developers' Guide* for the 1000, "Applications that require nearly all of a 128K PC and most Basic applications will require 256K (on the Model 1000)."

Some keyboard input presents another potential problem area. Codes at the hardware interrupt level differ between the PC and the 1000. Thus, says the *Guide*, "software that accesses the keyboard ports directly will not function properly."

Other programs that might not work correctly include those that use software timing or delay loops; that run with the IBM monochrome adapter; that use spe-

Base unit (main unit and keyboard, 128K, one drive)	$1,199.00
VM-2 Mono monitor (26-3211)	159.95
CM-2 Color monitor (26-3212)	549.95
Second disk drive (25-1005)	299.95
128K expansion (25-1004)	299.95
300-baud direct-connect modem (25-1003)	179.95
RS-232 interface (25-1006)	99.95
Touch Pad (26-1185)	59.95
RF modulator (15-1273)	24.95
Future options (release dates to be announced)	
Hard disk interface board	
Light pen	
Mouse	
Network board	

Table 2. Model 1000 price list (Radio Shack catalog numbers appear in parentheses).

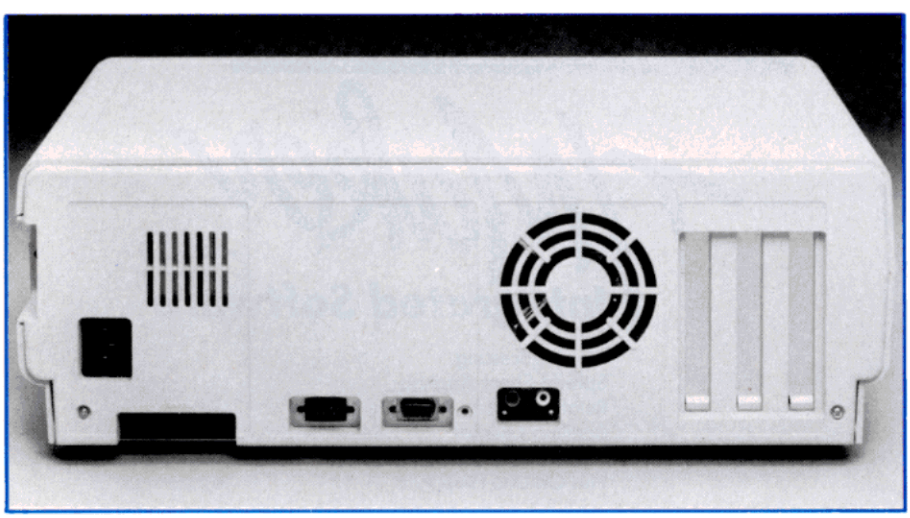

Photo 3. The back of the Model 1000. From left to right: the power connector, the parallel printer port, light pen port, RGB monitor port, video and audio ports, and three expansion card slots.

Courtesy of Radio Shack, a division of Tandy Corp.

Business Packages	
HomeworD	Sierra Online
HomeworD Speller	
pfs:File	Software Publishing
pfs:Report	
pfs:Graph	
pfs:Write	
Lotus 1-2-3	Lotus
Business Accounting	Tandy
Portfolio Decisions	Eagle Software
Finance Manager	InterActive Software
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Videotex Plus	Tandy
DR Graph	Digital Research
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Microsoft Word	
Cobol Development	Ryan McFarland
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Kindercomp	
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Alphabet Zoo	
Kidwriter	
Trains	
Pipes	Creative Software
Learning in Leeper	Sierra Online
Knoware	Knoware
Wizard of Id Touch Type	Sierra Online
Entertainment Packages	
Chinese Juggler	Creative Software
Demon Attack	Imagic
Micro Illustrator	Island Graphics
One on One	Electronic Arts
Pinball Construction Set	
Lode Runner	Broderbund
BC's Quest for Tires	Sierra Online
King's Quest	
Cutthroats	Infocom

Table 3. Software Tandy will release for the Model 1000.

Courtesy of Radio Shack, a division of Tandy Corp.

Tandy Intros XT Compatible

Houston, Sept. 18—Exhibitors at Houston's Personal Computer Showcase were greeted with a surprise this morning—yet another IBM-compatible computer from Tandy.

The Tandy 1200, a PC/XT workalike, appeared with no fanfare in many of the 125 exhibition booths, sending vendors scurrying for DOS disks and PC versions of their software.

The computer comes with Intel's 8088 4.77-MHz microprocessor. It has a 10-megabyte hard disk, one 360K double-sided, double-density floppy drive, and 256K of RAM. The basic unit sells for $2,999; with a monochrome adapter and the VM-3 monochrome monitor, the price goes to $3,437. (According to Tandy, an IBM PC/XT with monochrome adapter and monitor costs about $4,920.) A Tandy 1200 color system costs $3,847.95, compared to $5,394 for a similar PC/XT.

The 1200 is expandable to 640K RAM. It comes with a parallel interface and five PC/XT-compatible expansion slots. The 84-key keyboard is like that of the IBM.

Unlike the 1000 and 2000, the 1200's keyboard and expansion box are housed in metal casings, making the unit heavier but significantly limiting its radio frequency emissions.

The 1200's options include monochrome and graphics display adapters ($219 and $299, respectively), the 13-inch CM-2 high-resolution color monitor ($549.95), the VM-3 monochrome monitor ($219), and MS-DOS 2.11 and Microsoft Basic ($89.95).

Tandy is also offering Tecmar's Captain multifunction board for $795. The board includes 384K of RAM, an RS-232 serial port, a clock/calendar with battery backup, and a second parallel printer port. Its software includes a RAM spooler, RAM disk, and appointment alert.

A Tecmar Graphics Master board ($695) features 640- by 400-pixel resolution and PC Paintbrush software.

Tandy will provide third-party software that includes Framework and dBase III from Ashton-Tate, the PFS series from Software Publishing, and MicroPro's WordStar word processor.

Low-Key Announcement

Tandy chose a decidedly low-key style to introduce the 1200: The machine simply appeared. The company's attitude seems to be that the 1200 is available to those who want a low-cost PC/XT, but it's not something to get terribly excited about. Tandy executives almost certainly don't expect the same kind of sales figures they do from the Tandy 1000, Model 4/4P, or Color Computer.

Meanwhile, vendors' attitude is, "If our software runs on the 1200, then we like it." At the Houston show, one of five such shows sponsored by Tandy to stimulate third-party interest in the Tandy line, manufacturers seemed to have no trouble running their PC programs as-is.

The 1200 is yet another sign of Tandy's commitment to the standards set by the IBM PC and MS-DOS. It slides comfortably between the 2000 and the 1000, and reflects Tandy's philosophy to sell a computer for every market and need. ■

Feature	Tandy	PC	PCjr
128K RAM	Yes	Yes	Yes
Mono graphics	Yes	Option	Yes
Color graphics	Yes	Option	Yes
Joysticks	Yes	Option	Yes
Keys on keyboard	90	83	62
Light Pen	Yes	No	Yes
Network	Option	N/A	N/A
Hard disk	Option	Option	N/A
Second floppy	Option	Option	N/A
Printer interface	Yes	Option	Option
DOS/Basic included?	Yes	No	No
Bundled applications?	Yes	No	No
PC expansion slots	3	5	0

Table 4. The Model 1000, IBM PC, and IBM PCjr compared.

cial characters, codes, and graphics; or that directly address the floppy disk controller.

Also, while the joysticks are IBM compatible, the *Guide* warns that most joystick software uses software timers, and thus probably will not work on the 1000.

Finally, any IBM software that uses DMA will require the 128K expansion card.

Conclusions

On the one hand, the Model 1000 is Tandy's concession to IBM's dominance in the microcomputer market. It offers no technological breakthroughs, as did the Model 2000, and signals an abrupt departure from proprietary systems, such as the Model 4. It leaves Apple as the only company that continues to march to the sound of its own drum. This decision to join the party ranks will disappoint many of the Tandy faithful.

On the other hand, the Model 1000's price can't be beat. Tandy is doing what it does best—offering inexpensive hardware. Old Models I and III owners can enter the IBM/MS-DOS world for a reasonable price. And businesses with several IBMs already installed can add units for about two-thirds the cost of a PC.

One of the most pleasing aspects of the 1000 is that Tandy is offering it in several configurations, as has been its tradition with the Z80 machines and Color Computers. Thus, someone with a tight budget can spend $1199 for a base unit knowing that he can expand the system as his needs and interests grow. This could also create a healthy third-party market, with discount houses selling second drives, memory upgrades, expansion boards, and the like.

Whatever your feelings about the Model 1000, it is final confirmation that Tandy's future is with MS-DOS. The company will do whatever it must to survive, even if that means following in IBM's footsteps. ■

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The Tandy DeskMate

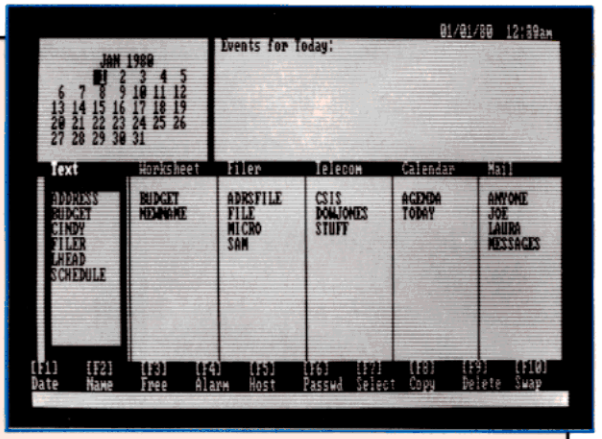

Photo. The Tandy DeskMate's main menu.
Courtesy of Radio Shack, a division of Tandy Corp.

DeskMate is a multipurpose business program that Tandy will bundle with each Model 1000. It includes six primary applications: Text, Worksheet, Filer, Telecom, Calendar, and Mail. DeskMate can also act as a host computer, permitting remote access to any of DeskMate's files.

According to Tandy executives, DeskMate has two major purposes: to give the new owner software that is immediately useful, and to introduce him to the kinds of software he will eventually want as full-blown packages. DeskMate's modules, then, are generic in nature—functional but unadorned by fancy bells and whistles. "Easy to use" and "simple" are the terms Tandy's promotional material uses most frequently to describe the product.

DeskMate has some of the rudimentary features of an integrated software package. First, the modules share several functions, including a calculator, a phone dialer for use with an auto-dial modem, and an alarm. Second, the modules share basic commands and function keys. And third, you can transfer some files from one module to another. For instance, you can save a spreadsheet in ASCII format and then merge it with a text file.

All of the modules are available from a main menu, which also includes a calendar and a things-to-do list (see the Photo). The menu displays each module's current files; you select the module or file you want by moving the arrow keys and pressing the enter key, much as you do on the Model 100.

Also from the main menu, you can rename files, display free space on the current work disk, assign passwords, and copy and delete files.

Main Applications

DeskMate's main applications are:

Text. A simple word processor. Its functions include Find, Add/Replace, Merge, and Substitute. You can also define a text block and then delete it, or copy it within the document or to disk. As with the Model 100's text editor, Text is always in the insert mode.

Worksheet. A 99-row by 99-column spreadsheet. Worksheet is similar to VisiCalc, and includes many of its functions. Cell formats include left and right justification, decimal, integer, and dollar. You can define a block of cells and delete it, merge it, or copy it within the same spreadsheet or to disk.

Filer. A file management module. Filer permits 256-character records of up to 21 fields. Its functions include Order (identifies field as sort key), Find, Print, Merge, Copy, Add, and Delete.

Telecom. A communications module. Telecom has both voice- and computer-dialing functions, as well as an answer mode. It also has an auto-log function that lets you define automatic log-on sequences for host computers.

Calendar. A calendar for scheduling and planning.

Mail. A miniature electronic mail system. With Mail, the Model 1000 can receive e-mail from other computers or directly from the keyboard, thus turning it into a local bulletin board system.

Of the subfunctions, Host is the most interesting. It lets you access DeskMate from a remote terminal or computer, from which you can read and send files and mail.

The Phone subfunction lets you enter up to 79 phone numbers, including area and special-prefix codes. Phone includes sort and search functions, and can be used with an auto-dial modem for automatic calling. ■

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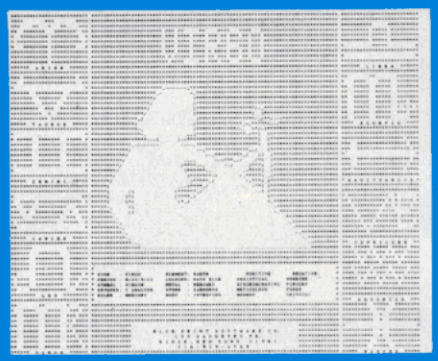

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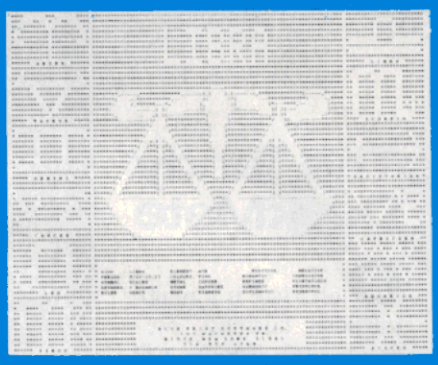

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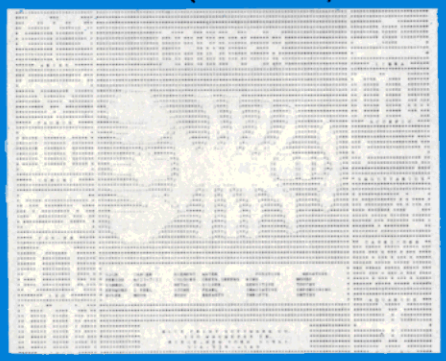

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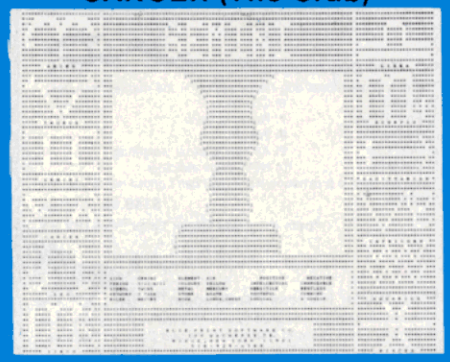

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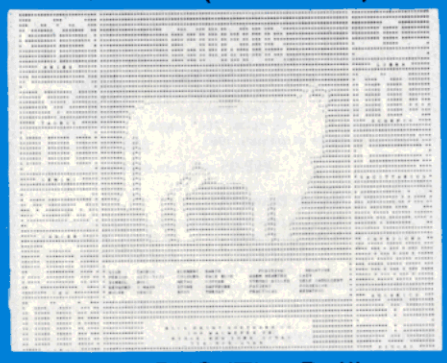

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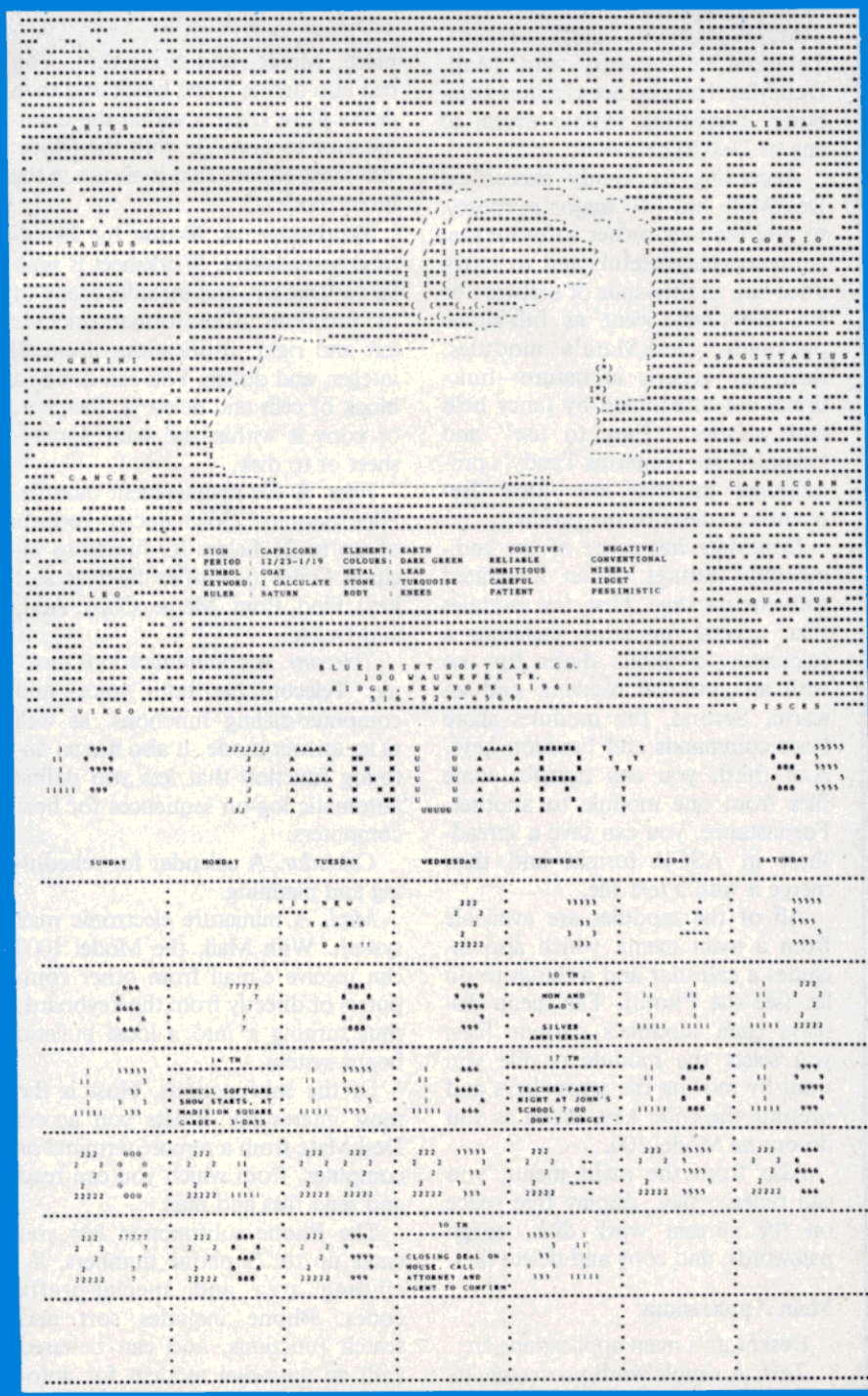

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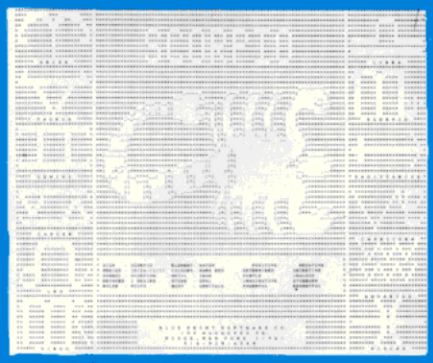

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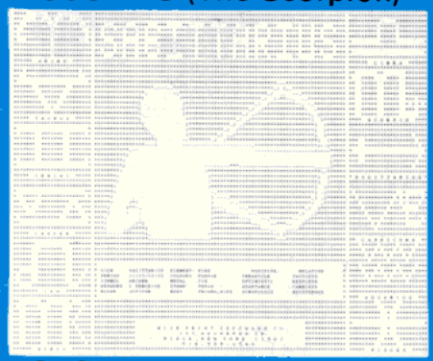

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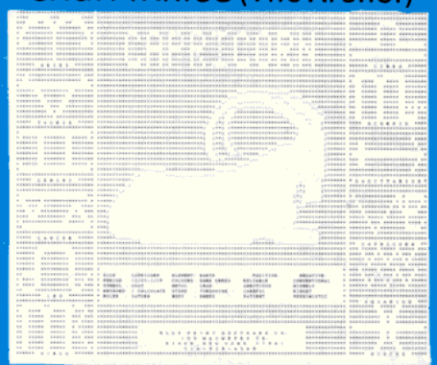

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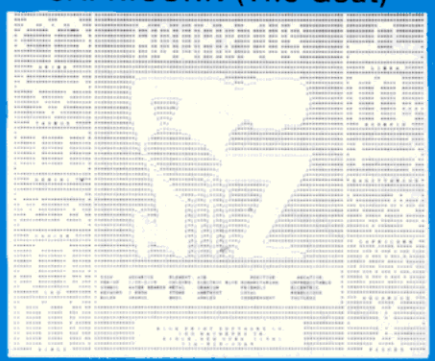

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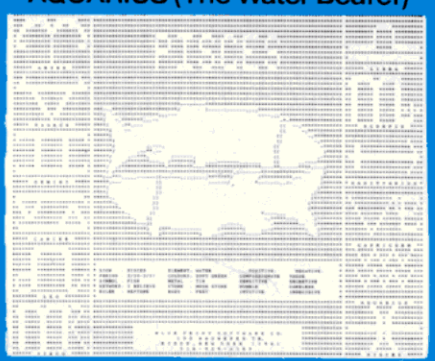

PISCES (The Fish)

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This is the most advanced and versatile section of the system. It can produce a calendar for any given year from 1984 through 9999. It can print a month, a range of months or a whole year in one run. The best part is that through this special software you can customize any or all dates. As shown in January's example, national holidays, personal appointments and business meetings can be noted and highlighted. This means you can plan a full year of dates to be remembered. Or just plan a month at a tme and use the calendar as an appointment system. At the end of the year you can easily clear all temporary noted dates and then set up a new year. Shown below are the three formats available for the date boxes.

THE ZODIAC PICTURES:
Featured with the Zodiac Time-Watch Calendar System is a set of beautiful graphic designs of the 12 symbols of the Zodiac. Each of the pictures can be assigned to print with any month you choose. Shown in the display are actual photographic reductions of an original print, with no touch-ups! So you will get the same quality artwork you see here.

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Along with each picture is an area that list informative and amusing characteristics of each sign. I'm sure we all know someone with Capricorn's traits. This area is also optional. You choose to print it or not. If the trait box area is not printed the picture will automatically re-center itself.

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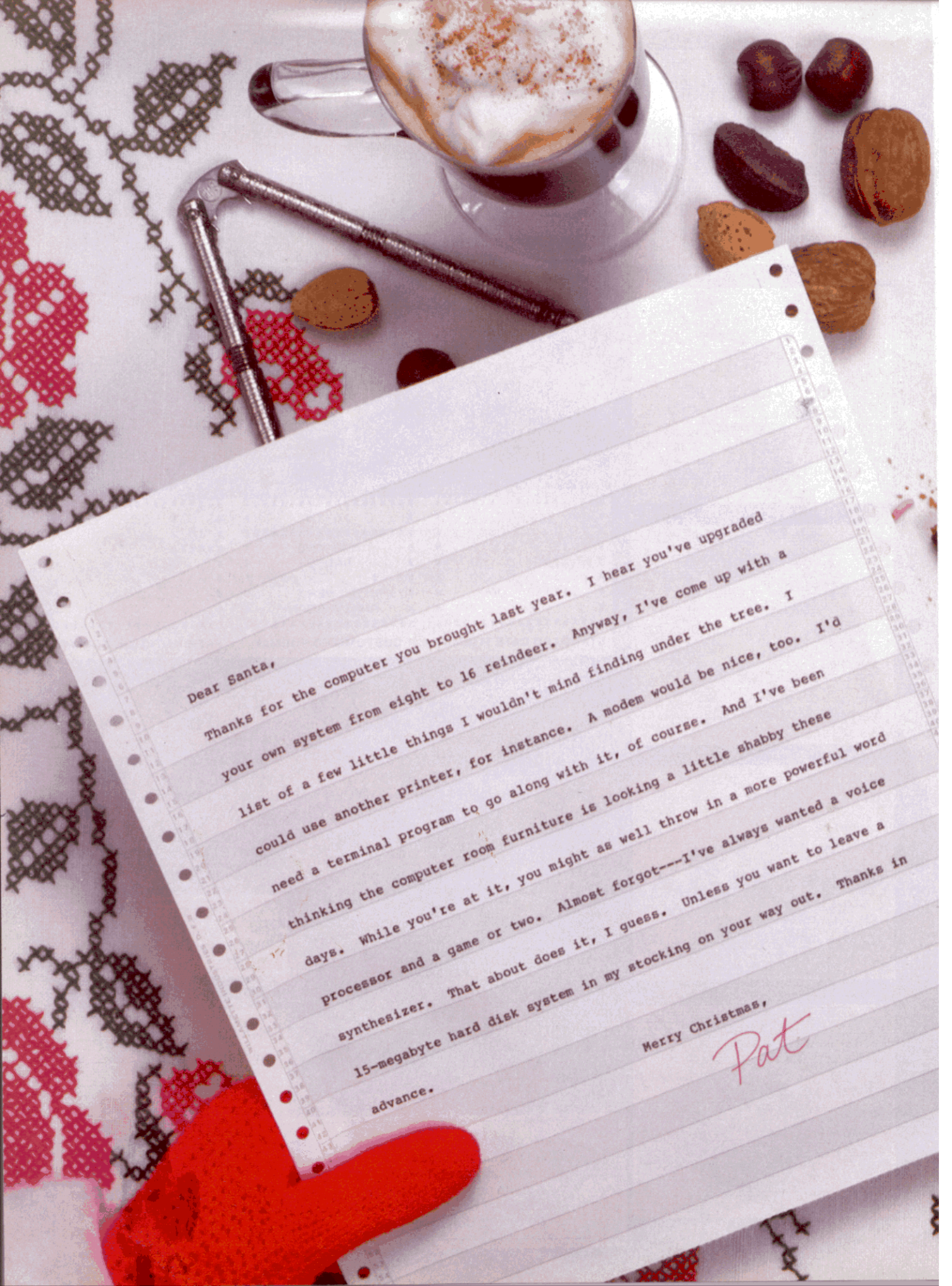

Dear Santa,
Thanks for the computer you brought last year. I hear you've upgraded your own system from eight to 16 reindeer. Anyway, I've come up with a list of a few little things I wouldn't mind finding under the tree. I could use another printer, for instance. A modem would be nice, too. I'd need a terminal program to go along with it, of course. And I've been thinking the computer room furniture is looking a little shabby these days. While you're at it, you might as well throw in a more powerful word processor and a game or two. Almost forgot---I've always wanted a voice synthesizer. That about does it, I guess. Unless you want to leave a 15-megabyte hard disk system in my stocking on your way out. Thanks in advance.
Merry Christmas,
Pat

The 80 Micro Gift Guide

A word about the Gift Guide.

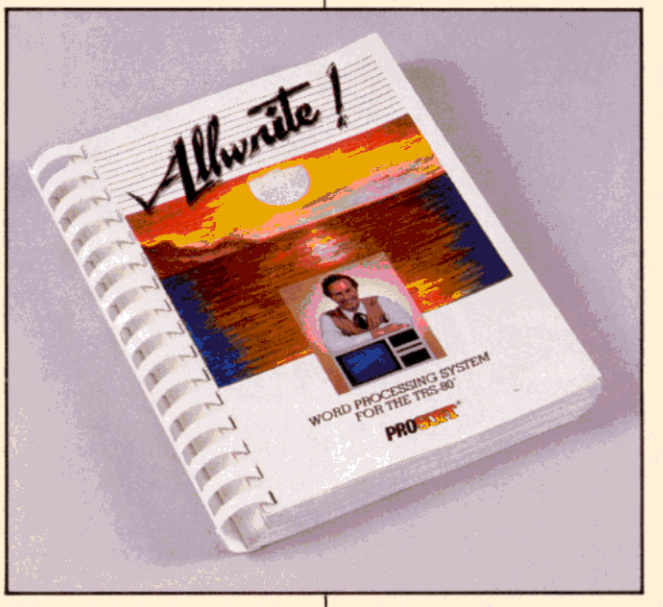
This is a sampler, a selective look at what's available for the TRS-80 user this holiday season. The 80 Micro *staff chose some of the products. We also asked our five associate editors, known to readers as the authors of columns, articles, and reviews, to submit gift picks of their own. Hardin Brothers writes The Next Step. David Engelhardt is the author of a number of articles and reviews that have appeared in the magazine. John B. Harrell III's new column, 2000 Plus, started in August. Terry Kepner writes Feedback Loop. Thomas Quindry writes reviews, tutorials, and programs.*

The gifts range from bargain-priced stocking stuffers to expensive add-ons, and include hardware, software, and accessories. The only requirement is that the product be related to TRS-80 computing. For your convenience, we've singled out specific products and provided ordering information; however, we encourage you to consider and compare a variety of products in any of the gift categories.

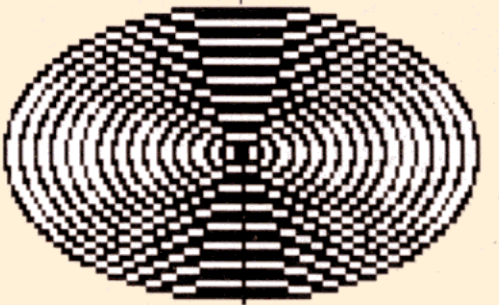
Alphabet Souped Up

Allwrite is a high-octane, high-performance word processor. The price is on the high side, too, but Terry Kepner says the program's well worth the money if you need professional-quality word processing. Allwrite supports more than 40 printers, and its features include text recovery, file status checker, and index and table-of-contents facilities. Permits easy handling of book-length documents.

Special sale price of $195 through Dec. 31, 1984; thereafter it's $249.95. For the Model I, III, or 4. Available from Prosoft, Box 560, N. Hollywood, CA 91603, 800-824-7888, operator 422. Express orders, 818-764-3131.



Allwrite



Package Deal

Our reviewer called **Computents' A-B-See** integrated software package "seriously underpriced." That's *under*priced. The package includes screen graphics, a file editor, word processor, and a telecommunications program. You can draw, save, and print figures using the screen graphics program. Its keyboard driver supports macro commands. For the Model I or III; requires 48K of RAM and two disk drives.

$89.95; available from Computents, 980 John Adams Parkway, Idaho Falls, ID 83401, 208-529-2492.

A-B-See's graphics

Sentinal Color Diskettes

Hush 80 Portable Silent Printer

Silent Night

A printer can sound like O'Hare airport at rush hour. The name of the **Hush 80 Portable Silent Printer** tells you that this is one machine that doesn't make a lot of noise. The Hush 80 is a thermal 6- by 7-pin dot-matrix printer that prints 80 characters per second. At $159.99, it's one of the most inexpensive 80-column printers around. It weighs 5 pounds and houses a 100-foot roll of paper under its cover; battery pack is optional.

For more information contact Ergo Systems Inc., 1360 Willow Road, Menlo Park, CA 94025, 415-322-ERGO.

Carry On

So a package of disk labels just won't do it this Christmas? You have some extra change rattling around in your pocket and you're planning to leave a new computer under someone's tree. The **Model 4P** transportable is easier to wrap than a lot of machines, and it's an attractive system for its price. *InfoWorld* calls the 4P the sleeper of Tandy's micro line. At 26 pounds, it's light enough to carry around, but it comes with heavy-duty features like two built-in disk drives, 64K of RAM, and 80-column by 24-line display. Supports Model III and 4 software and is CP/M Plus-compatible. Runs on ac current. $1,299. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102.

Rainbow Coalition

Until recently, disk jackets were like early Ford cars: You could have any color as long as it was black. But no more. Several manufacturers now offer disks in rainbow hues. Hyper-organized people can use them to color-code disk files according to application; orange disks might hold your data base, blue your spreadsheets. Other disk users might welcome a change from basic black.

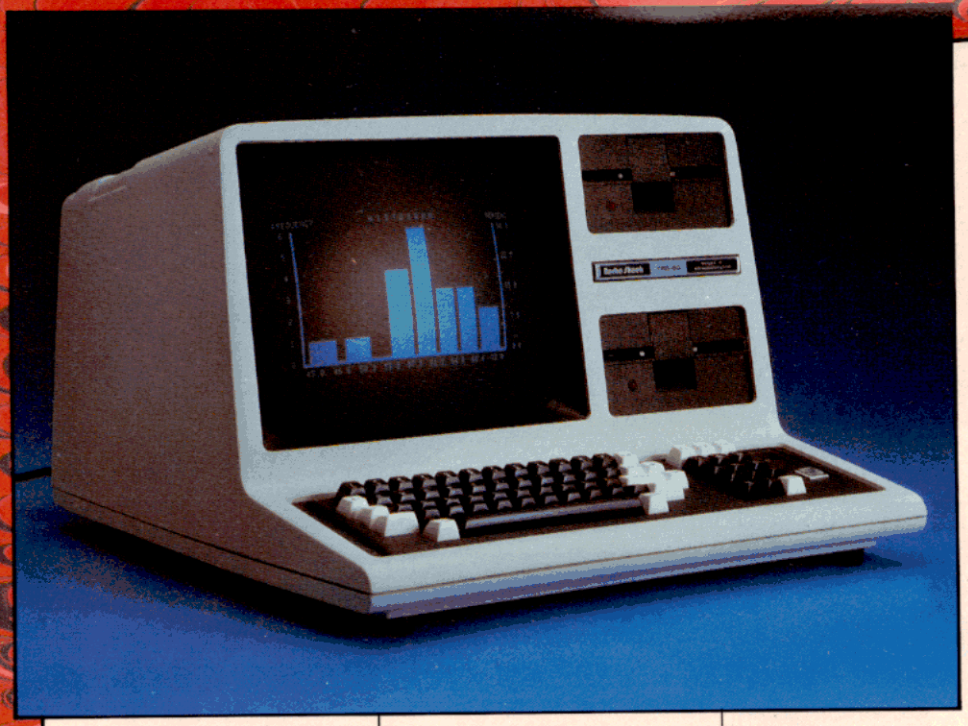
Sentinal Color Diskettes come 10 to a box, all one color or in assorted colors. Suggested retail price for a box of 5¼-inch, single-sided, single-density disks is $29. Widely available. Sentinal Technologies, One Sentinal Plaza, Hyannis, MA 02601, 800-323-5005, in MA 800-323-5001.

Utilities Included

For the Model 2000 user, John B. Harrell III suggests **utilities packages developed by ALPS**. A directory/file search/back-up package sells for $59, as does a tool assortment that lets you define a command string as a single key, count the lines in a file, dump files in hex and character format and change attributes of files. The Ramdisk utility lets you use extra memory as a superfast disk ($49); ALPS also has a serial printer attachment utility ($49) and a printer initialization program ($39).

ALPS, 23 Angus Road, Warren, NJ 07060, 201-647-7230.

Model 4P



High-resolution graphics

New Year's Resolution

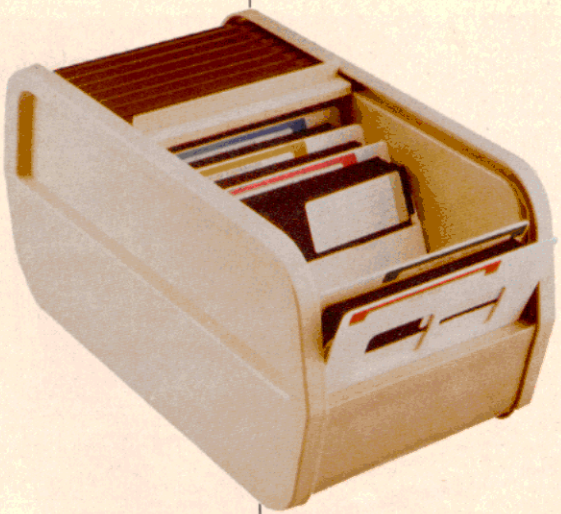
Yes, Virginia, you can get high-quality graphics on the Model 4. **Radio Shack's high-resolution graphics board** adds the power to create charts and graphs, designs, illustrations, and animation. John B. Harrell III calls the hi-res board "a very desirable add-on for the Model 4." The video display is 640 by 240 pixels. A Model III hi-res board is also available.

The Model 4 board is $249.95 uninstalled; the Model III version is $369.95. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102.

Disk Access

Let a few dozen disks get out of hand and you're talking chaos in the computer room. For keeping disks under control, David Engelhardt recommends the **Rolltop 100 Disk File**. Measuring 7 by 7 by 13 inches, it holds up to 120 disks and comes with file dividers and color-coded labels. Putty-colored body with bronze-colored sliding top.

$36; available from MicroComputer Accessories Inc., 5721 Buckingham Parkway, Culver City, CA 90230, 213-641-1800.



Rolltop 100

Chip-Tote

Open and Shut Case

The owner of a travelling computer has to have something for the computer to travel in. **Kangaroo's Chip-Tote PCD-1** is a foam-padded nylon carrying case for the Model 100 that opens up to form a lap-top work area. The case has packets for papers and a detachable pouch for batteries, phone cord, coupler, and ac adapter. Hand and shoulder straps are included. Comes in black or gray.

The Chip-Tote is $59.95. You can order it from Kangaroo Video Products Inc., 10845 Wheatlands Ave., Suite C, Santee, CA 92071, 619-562-9696.

The Great Communicator

For someone who's itching to get into communications, a smart terminal program might be the best of all possible gifts.

Lindbergh Systems, maker of the highly respected Omniterm program, has come out with a deluxe version called Omniterm 2. It's menu-driven, supports full- or half-duplex operation, and features scroll-back capability, macro keys, and a transit editor.

For the Model 2000 or PC-compatibles; $245. Available from Lindbergh Systems, 49 Beechmont St., Worcester, MA 01609, 617-852-0233.

Microfazer printer buffer

In the Buffer

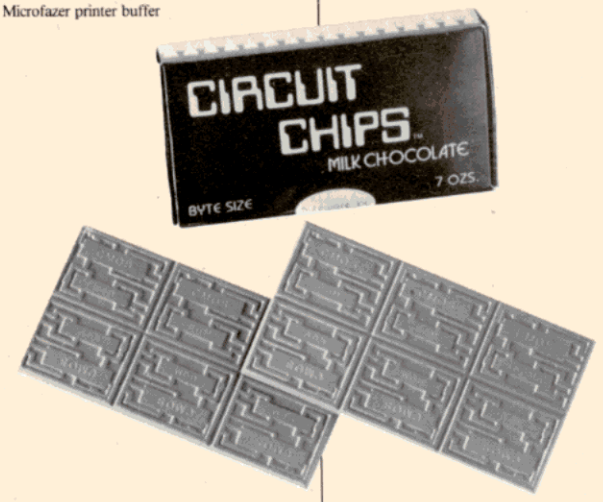
Not everybody welcomes printing delays as a chance to catch up on that needlepoint project. For users who want to continue working on the computer while printing a document, Hardin Brothers suggests **Quadram's Microfazer printer buffer.** "I've never found in-memory or disk-based printer spoolers particularly worthwhile. This hardware buffer is a superb tool for any serious user." The Microfazer is enclosed in a metal case and has a pause/copy feature that lets you make additional copies of buffered data.

Prices vary; parallel-to-parallel buffers range from $179 for 8K of RAM to $1,395 for the 512K model. Quadram Corp., 4355 International Blvd., Norcross, GA 30093, 404-923-6666.

Z It Now

After you've killed an hour waiting for a simple Basic graphics program to execute, you begin to wonder if there isn't a better way. A Basic compiler converts a program to machine language and lights a fire under it. **ZBasic 2.2** is an updated version of a compiler that has been around for years. Z is an interactive compiler, meaning the source program, compiler program, and object program all reside in memory at the same time. Z permits block memory moves, fast memory searches, and lets you choose where the program resides in memory.

Disk version is $89.95, tape version $79.95. Available from Simutek Computer Products Inc., 4897 E. Speedway, Tucson, AZ 85712, 800-528-1149. MC, Visa, American Express accepted.



MicroGoodies' chocolate chips

Candy Corporation

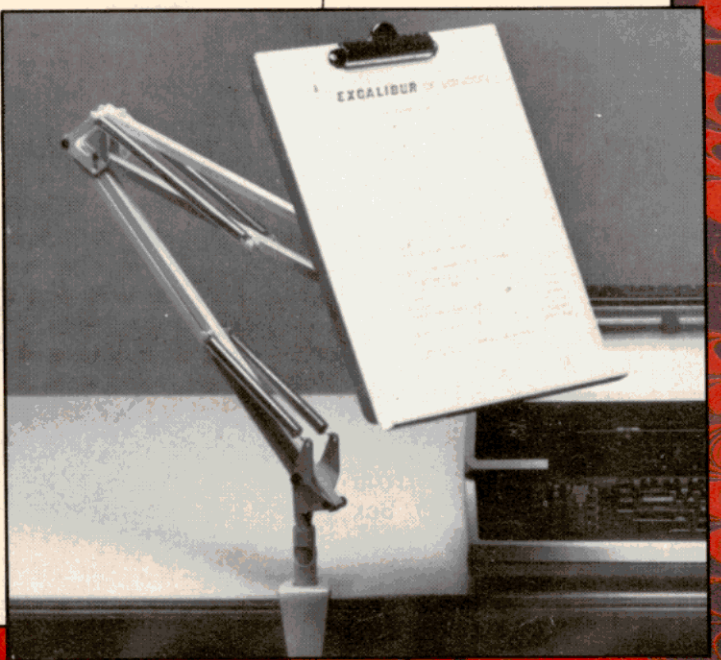
This may be a gift guide for computer users, but we had to get food in here somehow. Terry Kepner obliged by picking **MicroGoodies' milk chocolate circuit chips and disks** as a gift idea.

A box of two chips (net weight, 7 ounces) costs $11.95; two disks (net weight, 8 ounces) are $12.95. Available from MicroGoodies, 88 Orchard Road CN 5283, Princeton, NJ 08540, 800-221-0866; 201-874-4328 in NJ.

Clamp, Clamp, Clamp

A paper holder may not be pretty, but it's a handy accessory for anyone who types in long programs or who uses a word processor. The **Paper Boss** clamps onto a computer table and has a 36-inch flexible arm. Thomas Quindry says, "It seems ideal for the *80 Micro* reader. The clip-on top easily holds a magazine while you type in a program. Comparable items can cost twice as much." Comes in beige steel.

$19.95, including shipping. Available from Home Base Supply, 422 Soquel Ave., Santa Cruz, CA 95062, 800-824-3251, in CA 800-824-3252. MC and Visa accepted.



Paper Boss

No "L"

With a spelling checker, you don't have to worry about leaving a letter out of a word. The popular **Electric Webster** program proofreads text, displays words in context, displays correct spellings, and has an expandable 50,000-word dictionary. A great gift idea for a student, writer, or anyone who uses a word processor to prepare reports and papers.

For the Model I, III, or 4. Specify your word processor. $89.95, with correcting feature $149.95. Cornucopia Software, P.O. Box 6111, Albany, CA 94706, 415-524-8098.

Both Sides Now

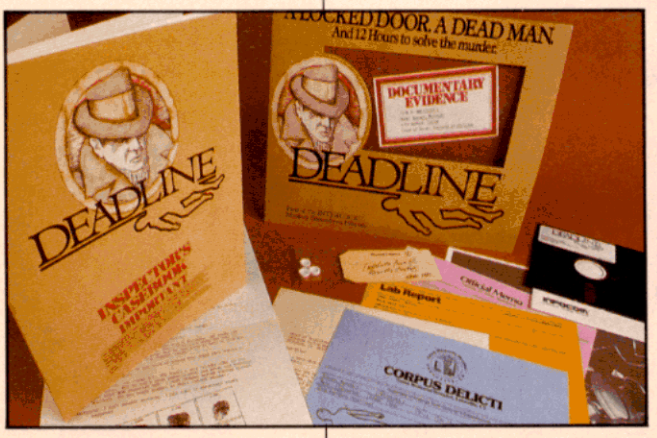
Terry Kepner recommends trying a little punch this Christmas. The **Flip It disk-punching kit** lets you convert a single-sided disk to a flippy. A steel guide ensures proper placement of the punch before you cut a new notch. Kepner says, "I use the kit to create double-sided disks for my archives. I wind up saving money by getting double-sided storage for the price of a single-sided disk."

The kit for 5¼-inch disks is $24.95; for 8-inch disks, $29.95. Add $3 for shipping. Available from D/Punch Corp., P.O. Box 201, Newton Highlands, MA 02161, 617-527-3547.

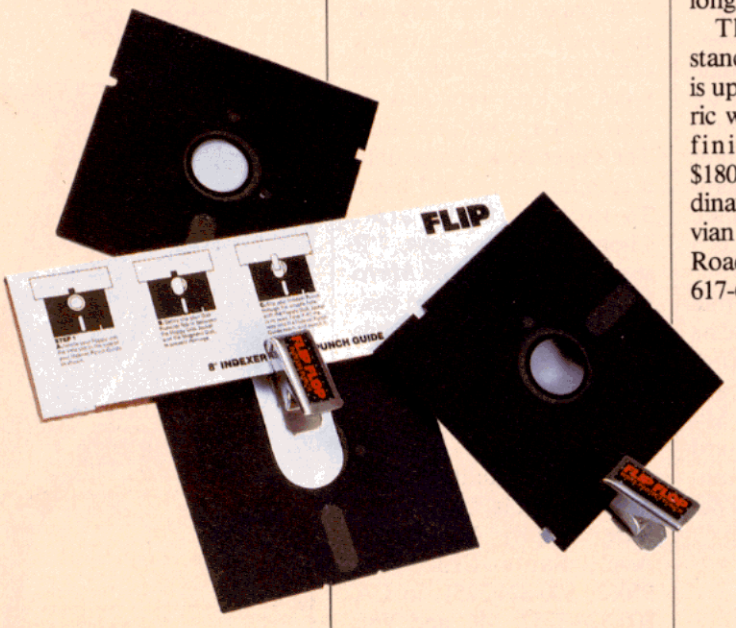
Elementary, My Dear Watson

Sherlock Holmes might not have been so smug if he'd tried **Deadline**, an interactive adventure game from Infocom. As chief of detectives, the player is given 12 hours to solve the locked-room murder of a rich philanthropist. Before starting the investigation, you review a dossier on the case that comes with the game disk. Careless detectives run the risk of being fired or of becoming murder victims themselves.

The Model I/III version is $49.95. Infocom, 55 Wheeler St., Cambridge, MA 02138, 617-492-1031.



Deadline



Flip-It

Balans Chair

Pain Go Away

Hardin Brothers, who suffers from a bad back, reports, "Several months ago, I bought one of those funny-looking backless chairs. What a superb invention! Since I started using it, I've never felt any back pain or stiffness, no matter how long I work at the computer. My chair rocks slightly, a feature I find important because it makes me shift my weight and position constantly, avoiding the effects of being in any position for too long."

The **Balans chair** fits standard-height tables, and is upholstered in cotton fabric with teak or beechwood finish. Approximately $180. Available from Scandinavian Design/Scandinavian Gallery, 603 Worcester Road, Natick, MA 01760, 617-655-2830.

Forever Amber

Hardin Brothers recommends a change of screen for any TRS-80 computerist: "Radio Shack's flickering, reflecting screen left me with headaches and tired eyes. The **Langley-St. Clair amber replacement CRT** was easy to install and immediately increased my productivity. If I were interested in arcade-style games, I'd have picked the faster-decaying green screen, but for word processing and programming, I've found the amber screen ideal." For the Models I, III, 4/4P, or II/12/16.

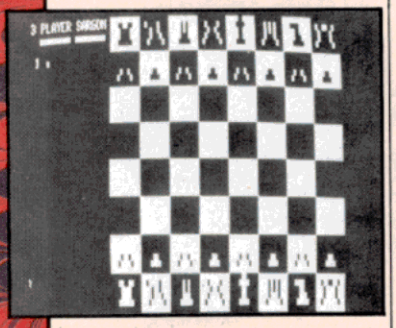
Nonreflecting amber Soft-View is $99.95 plus $7 shipping and handling. Available from Langley-St. Clair Instrumentation Systems Inc., 132 W. 24th St., New York, NY 10011, 800-221-7070, in NY 212-989-6876. MC and Visa accepted.

Langley-St. Clair replacement CRT

The Mating Game

Chess, of course. **Hayden Software's Sargon II,** says Thomas Quindry, "has to be one of the best bargains around in a chess program." Seven skill levels, scrolling score pad, hints for moves. For the Model I or III.

$19.95 plus shipping Available from Computronics, 50 N. Pascack Road, Spring Valley, NY 10977, 800-431-2818. MC, Visa, American Express.



Sargon II

Search and Rescue

Super Utility Plus is a SWAT team for disk users. It repairs damaged files, revives killed files, and reformats disks without destroying data, among other things. Widely recognized as a software classic.

Through Dec. 31, 1984, Powersoft is offering a special one-disk version of Super Utility Plus (for the Model I or III) or Super Utility 4/4P for $49.95, $30 below the regular price. Shipping is $3. Available from Powersoft Products, 11500 Stemmons Freeway, Suite 125, Dallas, TX 75229, 214-484-2976. MC and Visa accepted.

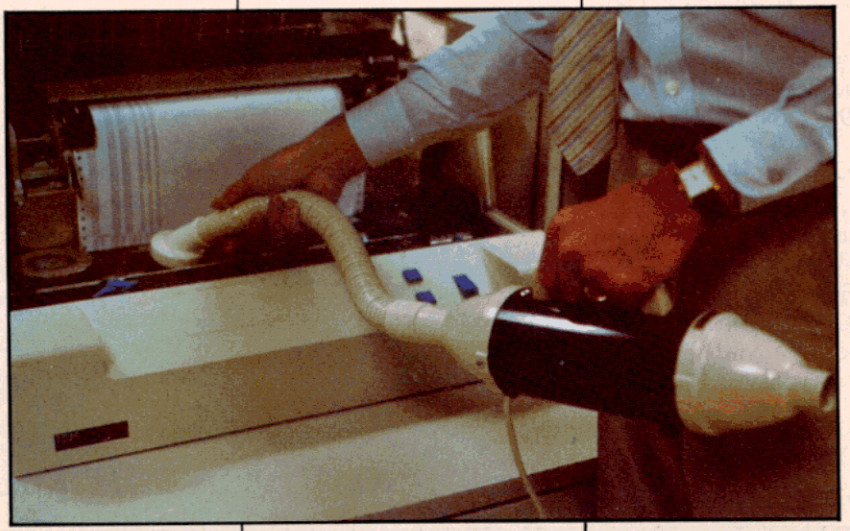
Super Utility Plus

Swept Away

Looking for a gift for someone who seems to have all the peripherals, software, and accessories known to man? How does a computer vacuum cleaner grab you? The **Data-Vac** is a unit designed to clean lint and dust from keyboards, printers, and other hard-to-reach areas. Converts from a vacuum to a blower; comes with a nozzle, soft brush, and pinpoint attachment. Price includes a shoulder strap and a supply of bags.

List price is $60. Metropolitan Vacuum Cleaner Co. Inc., 1 Ramapo Ave., Suffern, NY 10901, 914-357-1600.

Data-Vac



Volksmodem

Just Volks

If you're looking for a modem and don't want to spend a small fortune, David Engelhardt suggests you consider the **Volksmodem** from Anchor Automation. It's compatible with most systems and costs only $69.95 plus $11.95 for the cable. The Volksmodem operates at 300 baud with full- or half-duplex and features automatic selection of originate/answer modes.

Available from Applied Microsystems Inc., 612 Washington, Denver, CO 80203, 800-468-4474. Add $2.50 for shipping; MC and Visa accepted.

Dotwriter

It Takes All Types

It's no secret among computer users that standard dot-matrix typefaces are dull, dull, dull. It doesn't have to be that way, however. **Prosoft's Dotwriter** formats typefaces ranging from art deco to Celtic and from liquid crystal display to Gothic. You use your own word processor to create a text file saved in ASCII format, then run the graphics text formatter. The program comes with 14 typefaces; additional disks, with up to 12 lettersets, cost $17.95 or $24.95. Dotwriter supports certain Epson, Okidata, Radio Shack, and C. Itoh printers.

The Model I/III version is $79.95; the Model 4 version is $99.95. A design-your-own-typeface program, the Letterset Design System, costs $39.95. Available from Prosoft, Box 560, N. Hollywood, CA 91603, 800-824-7888, operator 422. Express orders, 818-764-3131. MC and Visa accepted.

Its Master's Voice

For a conversation piece, it's hard to beat a voice synthesizer. "If you know someone who can handle a computer that talks back," says David Engelhardt, "I recommend the **VS-100** for the Model I, III, or 4. It plugs into the expansion port; price includes amplifier, manual, and editing and demo software.

The synthesizer is $69.95; the speaker is $5.95; text-to-voice software costs $19.95 or $29.95, depending on features. Shipping is $3. Available from Alpha Products, 79-04 Jamaica Ave., Woodhaven, NY 11421, 800-221-0916; in NY 718-296-5916. MC and Visa.

VS-100 voice synthesizer

Mega-Gift

If you're a kid, it's a pony. If you're a serious computerist, it's probably a 15-megabyte hard disk system. It's what you really, truly want for Christmas, even though you know the odds are against you. For those of you with megabucks, John B. Harrell III suggests **Apparat's hard disk system**. Based on the 5¼-inch Winchester drive, the package includes the hard disk and power supply, controller, host/interface module, installation manual, NEWDOS upgrade and manual, and all the necessary cabling. For the Model I or III.

The 5-megabyte system is $1,489, 10-meg is $1,735, 15-meg is $1,945, 26-meg is $2,499. Apparat Inc., 4401 S. Tamarac Parkway, Denver, CO 80237, 303-741-1778.

Stocking Stuffers

Model 100 Bar Code Reader

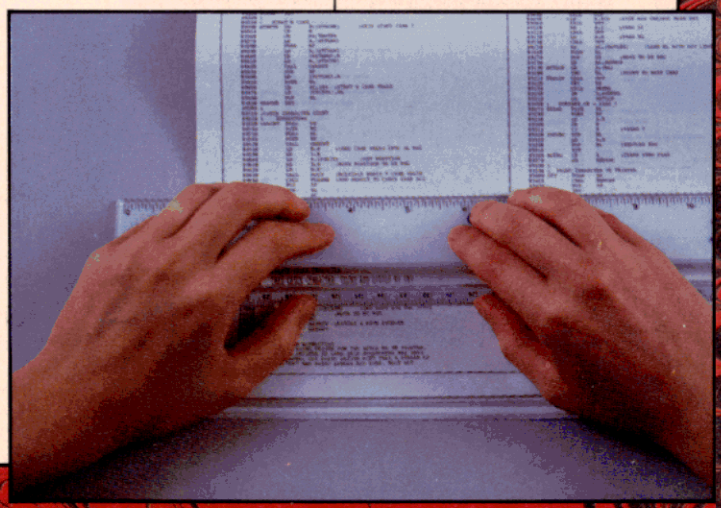
A Little Light Reading

Bar codes aren't just for pricing jars of pickled beets anymore. New applications are popping up all over the place. A **bar code-reading package** is available for the Model 100; it contains a Hewlett-Packard wand and software for reading three codes (UPC, 3 of 9, and Plessey). List price is $99.95. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102.

Larger than Life

With a **magnifying ruler**, you never again have to guess whether that black speck in line 1978 of your listing is a dead fly or a semicolon. Many computer supply retailers stock a 15-inch-long plastic ruler with a ⅜-inch magnification strip. Measures in inches and centimeters.

Magnifying ruler



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New Products—announcements of the latest TRS-80 products; the specs, sources of supply and price.
Project 80—for improving applications and the versatility of the TRS-80 computer.

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This year give **80 Micro** to all the TRS-80 users on your list. Just send in the coupon now! Or, for faster service call toll-free 1-800-258-5473. In New Hampshire, dial 1-924-9471 to give 12 issues of **80 MICRO** for $24.97.

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of spelling checkers
80 Microcomputing, 9/82

VOTED #1: For the second straight year, Electric Webster was voted the #1 spelling checker in the *80 Micro* Reader's Choice Awards. (1/83, 1/84)

"The most helpful program I've found is Electric Webster. After looking at nine proofreading programs, I've settled on Webster . . ." *Creative Computing, 11/83*

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"Now there's a program called Electric Webster that would let me write to Presidents and Kings and never feel embarrassed. Miss Mulberry would give Electric Webster an A+, and so will you." *Computer User, 1/84*

Performance "Excellent"; Documentation "Good"; Ease of Use "Excellent"; Error Handling "Excellent". *Info World, 8/82*

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Alpha joystick

Current Events

All it takes is a few millionths of a second for a power surge to do unspeakable things to data, software, or hardware. Surge protectors are designed to respond instantaneously to voltage overloads, stopping them in their tracks. **Curtis surge protectors** range in price from $49.95 to $89.95. All are switched and have a clamping response time of 1 nanosecond. EMI-RFI filtered models also protect against interference from office equipment and small motors.

Widely available. Curtis Mfg. Co. Inc., 305 Union St., Peterborough, NH 03458, 603-924-7803.

Curtis surge protector

Joy to the World

Captain Chuck of the Starship Trixie is about to fire a deadly laser beam at an enemy spacecraft. Does he reach for the space bar of a typewriter keyboard? Heavens, no. For a job like this, he needs a fire button. A **joystick**, offering true arcade control, would make a perfect stocking stuffer for the dedicated gamer. Alpha Products sells an assembled joystick for the Model I, III, or 4; supports eight directions and fire button.

$27.95 plus shipping; available from Alpha Products, 79-04 Jamaica Ave., Woodhaven, NY 11421, 800-221-0916, in NY 718-296-5916. MC and Visa accepted.

Coffee <Break>

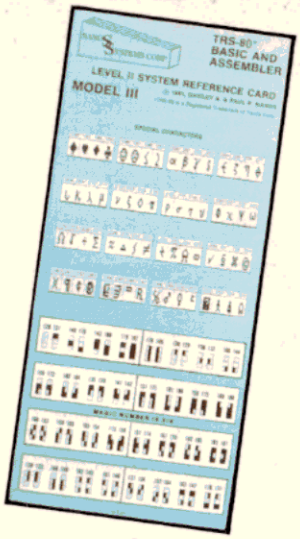
The **MS-DOS mug** is either a coffee cup disguised as a reference chart, or a reference chart disguised as a coffee cup. MS-DOS commands are listed in black and white with red, yellow, and blue accents. Keeps the Model 2000 user in touch with his operating system.

$7.95; shipping is free. Available from TechNovelty Inc., 102 Fenway Road, Columbus, OH 43214, 614-888-7111. MC and Visa accepted.

Plug In

Once you have communications software and hardware, all you need is somewhere to call. A subscription to **CompuServe** takes care of that. This on-line service provides a consumer data base and shopping facility, electronic mail, and, best of all, the chance to keep in touch with the computing community. Subscription includes the starter kit, user manual, and free connect time.

A basic subscription costs $39.95 and comes with five free hours. The Executive Information Service adds a business-oriented data base and more extensive electronic mail service; it costs $89.95 and includes two free hours. Line charges are $12.50 per hour during the day, $6 at night. CompuServe operates at 300 baud. For information, call 800-848-8199.

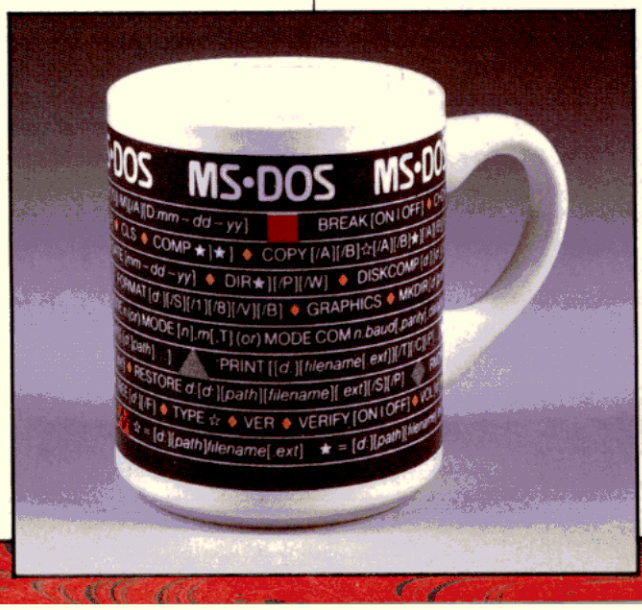


Nanos reference card

Christmas Cards

You won't find Currier and Ives scenes or reindeer cartoons on **Nanos cards**. These folding cardboard programmer's guides present a summary of commands and instructions for quick reference. Inexpensive and handy.

Model I Basic and Assembler is $4.95; Model III Basic and Assembler, $5.95; Z80 Microprocessor, $4.95; set of three Model II cards (Basic/Assembler, Supervisory Calls, and Commands and Utilities), $11.95; CP/M, $5.95. Add $1 for shipping. Available from Nanos Systems Corp., P.O. Box 24344, Speedway, IN 46224, 317-244-6888.



MS-DOS mug

1984 Review Digest

A summary of every review published in 1984. Products are rated from one star to five.

BOOKS

Computer-Assisted Investment Handbook (Programmed Press) ★★★ May: A collection of 50 short Basic programs that analyze stock market data; knowledge of the market is helpful.

Computer Buyer's Protection Guide (Prentice-Hall Inc.) ★★★ June: A well-written book that covers legal and common-sense safeguards of consumer rights.

CP/M Bible (Howard W. Sams & Co. Inc.) ★★★★ March: The definitive reference guide for CP/M.

Inside Super Utility Plus (Breeze/QSD Inc.) ★★★★ February: A clear, informative guide to the popular disk zapper.

Learning and Teaching Programming (Howard W. Sams & Co. Inc.) ★★ March: This crash course in Basic is useful as a resource, but incomplete as a text.

Learning TRS-80 Model 4/4P Basic (CompuSoft Publishing) ★★★★ September: A must for anyone who wants to learn Model 4 programming.

Model 4 Technical Reference Manual (Tandy/Radio Shack) ★★★★★ January: A complete reference manual covering Assembly-language programming and computer repairs and modifications.

Programming in C (Prentice-Hall Inc.) ★★★★ December: A well-written book that makes useful comparisons between Basic and C.

Soul of CP/M (Howard W. Sams & Co. Inc.) ★★★★★ January: A valuable guide to Assembly-language programming with CP/M.

Using TRSDOS 6.0 (Lynn Computer Service) ★½ January: A video tutorial that misses the boat.

Your First Basic Program (Sybex) ★★★★½ February: A clever and concise beginner's book.

GAMES

Child's Play (Indiana Software Group) ★★★ August: An entertaining and educational children's program for learning letters, numbers, shapes, and words. Models I, III, and 4.

Compu-Opoly (Dynacomp Inc.) ★★★½ August: A good Monopoly game that uses the whole screen as the board. Model III.

Monty Plays Monopoly (Tandy/Radio Shack) ★★ August: A limited program that uses the computer as your opponent. Model III.

13 Ghosts (Tandy/Radio Shack) ★★★ November: An entertaining game, but a bit slow.

Volcano Hunter (Lap Video Entertainment) ★★★★ September: An ingenious arcade-style adventure game.

Warriors and Warlocks (408614 Ontario Ltd.) ★ December: A frustrating and confusing game that's too challenging for a beginner.

HARDWARE

Bar Code Reader (Tandy/Radio Shack) ★★★½ October: A reasonably priced package that includes a pen wand and six programs. Model 100.

FPS-3 Hardware Copy System (J.E.S. Graphics) ★★★★ April: This circuit board that backs up protected software is a good value. Model III.

High-Res Graphics Board (Tandy/Radio Shack) ★★★★ October: A

plug-in circuit board that upgrades the screen to 640- by 240-pixels; a good peripheral but lacks software support. Model 4.

Intelliterm (Microcorp) ★★★ March: A very good smart terminal package. Models I and III.

microMERLIN (Micro Projects Engineering Inc.) ★★★★★ September: A well-designed 16-bit upgrade unit. Models I, III, and 4/4P.

Model 4P (Tandy/Radio Shack) ★★★★½ February: A portable with the features of a desktop.

Newclock-80 (Alpha Products Co.) ★★★½ June: A handy low-cost hardware unit that keeps track of the date and time. Models I, III, and 4.

PAT-1 (Dysan Corp.) ★★★★½ July: An accurate and multifunctional disk drive diagnostic tool.

PMD-100 (Holmes Engineering) ★★★★ June: A well-designed tape storage unit for the Model 100.

Reference Card for the CP/M System (Nanos Systems Corp.) ★★★ October: A handy pocket reference card that details most CP/M commands.

Signalman Mark XII (Anchor Automation) ★★★★½ October: An excellent modem at a good price.

Tandy 2000 (Tandy/Radio Shack) ★★★★ May: An MS-DOS machine superior to the IBM PC.

VS-100 Voice Synthesizer (Alpha Products) ★★★★ December: Inexpensive and fun.

LANGUAGES

Assembly Language Tutor (Tandy/Radio Shack) ★★★ September: A thorough tutorial, but no substitute for a real assembler. Models I and III.

Basic Learning Programs (Academic Computer Center) ★★½ February: An unexceptional package for teaching Basic programming. Model III.

Snake (James W. Burgmeier) ★★★★ February: An entertaining Basic language teaching tool for children. Model III.

PRINTERS

Brother Compactronic 60 (Brother International Corp.) ★★★★½ March: An affordable typewriter/printer.

DMP-110 Printer (Tandy/Radio Shack) ★★★ November: An adequate dot-matrix printer.

DMP-120 Printer (Tandy/Radio Shack) ★★★ November: A very good, competitively priced dot-matrix printer.

DMP-420 Printer (Tandy/Radio Shack) ★★★★ November: Excellent but expensive dot-matrix printer.

DWP-210 (Tandy/Radio Shack) ★★★★★ January: A superb daisy-wheel printer.

Juki 6100 (Juki Industries of America Inc.) ★★★★½ February: A very high quality daisy-wheel printer.

ThinkJet Printer (Hewlett-Packard) ★★★★ July: An outstanding, affordable inkjet printer.

SOFTWARE

A-B-See (Computents Inc.) ★★★★½ August: A thoroughly professional file editor, word processor, screen graphics, and telecommunications package. Model III.

Allwrite (Prosoft) ★★★★½ November: A world class word processing system. Models I, III, and 4.

Arranger II (Triple-D Software) ★★★★½ January: One of the best disk libraries around. Models I, III, and 4.

Career Directions (Jefferson Software) ★★★★★ April: An impressive self-assessment package that pinpoints career opportunities. Models III and 4.

College Directions (Jefferson Software) ★★★★½ June: A comprehensive program that helps students select a school. Models III and 4.

CP/M Plus (Tandy/Radio Shack) ★★★★ August: An updated version of CP/M for the Model 4 with some definite improvements.

Crayon Deluxe 2.0 (Pioneer Software) ★★★★ June: A versatile word processor/graphics package that formats a variety of typefaces and graphics designs. Models I, III, and 4.

dataCure (Colorado Online) ★★★ April: A CP/M disk repair tool; performs as represented but has some limitations.

Datagraph (Micro Software Systems) ★★★★½ January: A worthwhile high-resolution graphing program with a couple of annoying faults. Models I, II, and III.

DiskDISK (Logical Systems Inc.) ★★★★★ July: A useful package that partitions disks into files that your operating system treats as individual disk drives. Models I, III, and 4.

Disk Drive Analysis System (J & M Systems Ltd.) ★★★★½ April: An excellent disk diagnostic program. Models III and 4.

Filemate II (Datafile Systems) ★★★★ February: A data base manager that provides advanced features for its price range. Models I and III.

Investment Analysis (Tandy/Radio Shack) ★★★ May: A complex and pricey program for analyzing investment calculations. Model 100.

LeScript (Anitek Software Products) ★★★★ April: Word processing for the Model 4 comes of age.

MagicBind (Computer EdiType Systems) ★★★★ July: An impressive print-formatting and file-merging program. Models I, II, III, and 4.

MAP 1.3 (Softshell) ★★★★ June: A group of programs that index and search text and data files; performs well but short on disk space. Models II, III, and 4.

Math-Analyzer-Paks (International Communication) ★★½ March: A flawed tool for manipulating math formulas. Models I and III.

MicroEditor II (Alphaware Inc.) ★★ February: An elaborate word processor that's difficult to use. Model 100.

Micro-Link II (Bi-Tech Enterprises Inc.) ★★★½ October: An able and moderately priced communications package. Model 4.

Model 4 Scripsit (Tandy/Radio Shack) ★★★ May: An updated version of the original Scripsit. Best for short documents and correspondence.

Model 4 SuperScripsit (Tandy/Radio Shack) ★★★★ August: A word processing system that takes advantage of the Model 4's capabilities.

Multiplan (Tandy/Radio Shack) ★★★★★ June: Far and away the best spreadsheet.

Multimate (Tandy/Radio Shack) ★★★★★ December: Truly professional word processing. Model 2000.

NICE (XYZT Computer Dimensions Inc.) ★½ October: A complex integrated program that suffers from poor documentation.

Open Access (Software Products International) ★★★★★ November: An outstanding integrated package.

Personal Finance (Tandy/Radio Shack) ★★½ August: A limited checkbook and budget program. Model 100.

PowerMail Plus (Powersoft) ★★★★ May: A highly recommended mailing list program. Models I, II, III, 4, 12, and 16.

Scribe (Chattanooga Systems Associates) ★★★★ February: A very useful word processing program. Model 100.

6.0 Plus (Micro-Systems Software Inc.) ★★★★½ February: A powerful enhancement package for the Model 4 TRSDOS 6.0 operating system.

SofPac (Softronics Computer Systems) ★★½ July: A limited integrated software package that puts integration ahead of quality. Models I, III, and 4.

Spectaculator (Tandy/Radio Shack) ★★★★ October: An affordable and easy-to-use tape-based spreadsheet. Models I, III, and 4.

Sprinter (Scenic Computer Systems Inc.) ★★★ May: A sophisticated word processor for the experienced user; runs under the UCSD p-System environment.

Stock Tracker (H & H Trading Co.) ★★★★ April: A high-quality package designed to give market advice based on technical analysis of trends. Models I and III.

Superlog (KSoft) ★★★★ June: A valuable free-form information handler but only if you have LDOS. Models I and III.

SuperScripsit Dictionary (Tandy/Radio Shack) ★★★★ August: A fast and convenient proofreader with limited storage space for data files. Model 4.

The Talking Program (Ron Hutchinson) ★★★★½ January: A machine-language program that vocalizes everything appearing on screen. Models I, III, and 4.

Target PlannerCalc (Tandy/Radio Shack) ★★★★ April: An excellent and moderately priced spreadsheet program. Model 4.

Tele-Stock (Telesoft Inc.) ★★★½ April: An easy-to-use program for tracking daily variations in the stock market. Model 100.

Trend Analysis Program (Harley D. Wilbur) ★★★★ March: An ideal program for the investor interested in technical analysis of the stock market. Models I and III.

TRS-80 WordStar 3.0 (Logical Systems Inc.) ★★★ May: Software for the serious word processor. Models I and III.

UCSD p-System (PCD Systems Inc.) ★★★ May: A DOS that bridges the software gap between business micros. Models II, 12, and 16.

Universal Subroutine System (Ramona Enterprises) ★★★ August: A library of 207 proven Basic subroutines that's flawed by poor documentation. Models II, 12, and 16.

VEDIT 1.15e (Compuview Products) ★★★★½ January: A full-screen text and program editor with complete keyboard customization and word processing features. Model II.

Videotex Plus (Tandy/Radio Shack) ★★★ September: A difficult-to-use communications package. Model 4.

VisiCalc Business Forecasting Model (Tandy/Radio Shack) ★★★ January: A well-documented financial analysis tool. Model III.

WIBasic (WittSoft Inc.) ★★★½ July: An uncomplicated interpreter/compiler designed specifically to generate Z80 machine code. Models I and III.

Word Machine (Pel-Tek) ★★★★ February: An inexpensive word processor that's easy to use. Models I and III.

WordStar Professional (Micro Pro International) ★★★★★ January: An expensive, high-quality integrated word processing package.

UTILITIES

Alcor C Language Compiler (Alcor Systems) ★★★★ November: A well-rounded implementation of C.

ALDS (Assembly Language Development System) (Tandy/Radio Shack) ★★★★★ September: A top-notch editor/assembler.

The Analyst (Modular Software Associates) ★★★★½ May: Speeds up Basic by sorting variables; a good buy. Models I, III, and 4/4P.

Aztec C/80 Pro Compiler System (Manx Software Systems) ★★★★★ December: A truly sophisticated compiler system for high-level programming.

Back-Track (Ridge-Tec Inc.) ★★★★ December: A powerful utility for copying and recovering data on damaged disks.

Basrum (Wiley Inc.) ★★★★ November: A useful linking loader and library manager for Basic programs. Models I and III.

Clone III (Gibberman Enterprises) ★★½ July: A fast back-up utility that doesn't quite live up to its advertised promises. Models III and 4.

The Collector (Modular Software Associates) ★★★★ May: An efficient, reasonably priced string collector. Models I, III, and 4/4P.

CONV3TO4 (Educational Micro Systems Inc.) ★★★ June: This utility converts Model III Basic programs to Model 4 format; does the job but is slow.

Dostamer (CDC) ★★★½ April: A neat little utility that executes most DOS commands with a single keystroke. Models I, III, and 4.

Pro-Create (Misosys) ★★★★ October: A very good version of Misosys' popular EDAS IV editor/assembler. Model 4.

Super Utility 4/4P (Powersoft) ★★★★★ September: A streamlined version of the disk-zapping utility. Models 4/4P.

Toolbelt (Powersoft) ★★★½ May: TRSDOS 6.X disk utilities for the advanced programmer. Model 4.

Toolkit (Stewart Software) ★★★½ May: A collection of disk directory utilities. Model III TRSDOS.

Transfer (The Small Computer Company) ★★★★★ March: A utility program for transferring Profile Plus or Profile III Plus data files between two computers. Models II and III.

Transfer (MichTron Inc.) ★★★ July: An excellent Models I/III/4 utility for transferring Basic files to a Model 2000.

TRSDUM (CRB Microtools) ★★★★½ March: A handy TRSDOS utility for saving libraries of cassette programs to disk. Models I, III, and 4.

Turbo Pascal (Borland International) ★★★★★ December: A high-performance Pascal compiler.

Vis/Bridge/RPT (Solutions Inc.) unrated January: A VisiCalc report formatter.

Vis/Bridge/Sort (Solutions Inc.) ★★★½ January: A VisiCalc utility that sorts portions of a spreadsheet; on the pricey side. Models I, II, III, 12, and 16.

Viz.A.Con (Abacus Associates) ★ January: A VisiCalc worksheet utility that consolidates data from different worksheets; too rigid and complicated to be useful. Model III.

Model 4
Producer Version
Now Available

The PRODUCER
The Professional Program Writer.

YOU CAN MULTIPLY YOUR PRODUCTIVITY WITH THIS SENSATIONAL SOFTWARE BREAKTHROUGH

Beginners can now program with no experience necessary.
Professional programmers now have a tool to save days and weeks of time.

THE PRODUCER WRITES CUSTOM PROGRAMS FOR YOU!

Why buy expensive Data Base programs that are only half effective and require the original operating system disk to run the finished program? The Producer is a true stand-alone Program Generator that can create the exact programs you want.

You don't need any previous programming experience since The Producer writes all the code for you. And when the program is finished, it runs by itself without the support of the original operating system run disk.

What Kind of Programs Can The Producer Write?

With the Producer you can create impressive, sophisticated and functional software to manage your data. The only limit is your imagination. You can quickly and easily create programs to manage such things as mail lists, personnel records, inventory control, library catalogs, loan calculations, personal finances, and maintenance schedules.

You may never again need to buy a canned program to perform a needed task related to data storage and retrieval. The Producer can write all those programs for you, including the capacity to do all standard calculations and to generate both on-screen and printed reports. The freeform report generator even allows you to design reports on your preprinted forms.

How Does The Producer Work?

The Producer itself is a sophisticated program based on years of research and development. But The Producer was written with the end user in mind and the program generation process is quite simple.

You can begin by using a planning form designed to help you organize your program ideas. The Producer then asks you a series of simple English questions to enable those ideas to be translated into a program format. You use the computer's arrow keys and graphic characters to draw the data entry screen just the way you want it.

Then with the press of a button, the program generator takes over and does all that complex coding for you in a matter of minutes. The result is a complete program, capable of running by itself. That means your customized programs may be used independently of The Producer. (A feature not possible with Data Base creations.) You may duplicate your Producer generated programs and even sell them for others to use, without paying royalties.

How Difficult Is The Producer Process to Learn?

The Producer software package makes learning simple. An easy to follow tutorial takes you through each step of The Producer process as you sit at the computer. (This includes audio cassette tapes with the Model I/III versions.) This hands-on experience not only teaches you the process but allows you to create a program of your own design while you learn. The tutorial is all you need to get started.

Later, if you have need for more specific information, you can turn to the fully indexed Producer Reference Manual. The 200 pages of documentation cover virtually any question you may have so you will never be left guessing what to do next. The Producer package also includes a quick reference card to streamline your program operation and, should you ever need technical assistance, you may call a Producer Software technician for free counsel and trouble shooting.

Is It True That I Can Both Create and Edit At Will With The Producer?

Yes! Unlike most other program generators, The Producer gives you complete freedom to design the screen any way you wish. Experiment, rearrange, "cut and paste" between trial screens. That's the kind of versatility you get. And even after your program is complete, you can change your mind. With The Producer you can edit and refine finished programs without starting over. That's a real time saving.

What Are Some Other Outstanding Features Of The Producer?

- Our B-Tree file structure gives extremely fast access to data, allows global search and replace, data entry by batch mode and automatic file rebuilding.
- The Screen Generator is the best anywhere at any price and gives full screen control including graphics. You can add, insert, or delete, and move blocks of text on screen and between screens.
- All math calculations are supported including subtotals and global recalculations.
- The Freeform Report Generator gives you an amazing versatility to design text placement, interfield calculations, and formats. You can even print reports on your standard forms.
- The Producer package also includes a free Home Inventory program and a one year subscription to The Producer Newsletter.

The Producer
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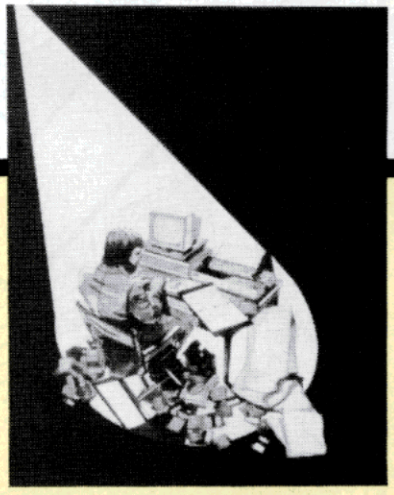
Owning a computer program that writes programs for you may seem like a science fiction dream. But that's exactly what The Producer does. You can now enjoy professional quality programs, custom written for your specific needs!



Here's a sampling of what Producer users are saying:

"This program has paid for itself over and over." People tell us this repeatedly. First time computer users have successfully been able to generate programs with The Producer that rival the professional quality of programs available through commercial sources.

"There are only two things you need to say about The Producer: it's easy to use and it's powerful!" The woman who told us this had used several computers before but had no programming experience. Now she is saving time, money and effort by creating the programs she needs for her office.

"Owning The PRODUCER is like having a professional programmer on call-24 hours a day. I particularly like the fact that if I design a program to do a specific job today, and later discover it is inadequate to my changing needs, I can regenerate the program with corrections in a matter of minutes." That's right. The PRODUCER gives you the ability to edit or expand your programs in any way you choose.

"The screen generator alone is worth the price! I created a professional data entry screen in minutes just after opening the package." With our screen generator, you are the artist and you are never locked into what someone else has designed for you.

"How did I ever live without it." This often heard quote comes from experienced programmers who are now using The Producer to generate programs in a fraction of the time it previously took to them to write programs.

"The Freeform Report Generator is an amazing feature. I never thought a product like this could give me the ability to get reports on my preprinted forms, but The Producer does it all." Yes, you can put the text anywhere on the page you want, do up to 100 interfield calculations, etc. And the Freeform is now a part of The PRODUCER package.

OTHER QUOTES FROM PRODUCER USERS

"The PRODUCER package I received was excellent. The finest software package I have ever purchased. Far beyond my expectations."
S.R. Foster, Pensacola, Florida

"I'm in love with The PRODUCER. It's one of my favorite programs."
R. Selsback, Burlingame, California

"The value of the deal, everything included, was the best I've seen to date."
G. Slusher, Martin, Kentucky

"Excellent! Above and beyond other software."
R. Hapgood, Henrietta, Texas

★

"The PRODUCER is the best all purpose program generator I have used. (We have tried almost all of them). The generated code is bug free, well commented and efficient."
A. Copella, Northbrook, Illinois

"This is by far my number one software and I will use it anywhere and everywhere I possibly can, both personal and in business."
R.A. Neuman, Okemos, Michigan

"The program I created with The Producer meets my needs exactly and I can change it easily as different conditions require. You can't do that with other software."
Neal Bloomenfader

"One of the best I've seen. We write about 20 volumes of material per year. Take it from a pro, it's good."
J. Crespi, Sherman Oaks, California

★

"Thank you for an excellent program. I agree that The PRODUCER will change the entire concept of program creation in the future. But for now, you stand as the best data base management system I can buy."
E. Sung, Vancouver, B.C.

"I think The PRODUCER will make the software hackers upgrade their products to this high level quality of the PRODUCER. I'm sure you realize that there is a lot of garbage on the market."
D.J. Smith, Lombard, Illinois

"The Producer is among the best systems I have used in ten years of professional data processing."
Dennis R. Cutshall, APO NY.

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Many of you have been asking for it, so here it is. With **Data Shuffler** you can perform powerful sort and merge functions in conjunction with your data files. • Sorts up to 32767 Records • Sorts key size up to 256 bytes • Does up to 9 sort keys in ascending and/or descending order • Includes a complete sort parameter builder program, etc.

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Illustration by John Craig

LITTLE WONDER

by Alain Cirkovic

This 200-record data base manager resides completely in RAM, giving you fast access to information and letting you scroll through the entire data base.

What's in a name? A lot in the case of Easydata, my Model I/III/4 data base management program. Just as its name implies, Easydata gives you easy access to anything from phone numbers and addresses to a list of the books you've read to a catalogue of your stamp collection. It holds up to 200 records of nine fields each. The program lets you create, extend, edit, search, print, display, and format files or selected records.

Easydata is a memory-resident data base manager; that is, all of the data base files reside in RAM, making data retrieval fast. In addition, you can scroll through the entire data base, much like you'd scroll through a Scripsit document.

The Model I/III/4 program uses 48K of memory, but 32K will suffice if you reduce the size of the files allowed. It works with any DOS, printer, or keyboard drivers that use the standard Input and Print commands. The program contains numerous error-checks that help prevent common mistakes, and you can call the command menus at any time. Easydata keeps track of any changes made, and reminds you to save your data before quitting the program.

Structure

Easydata organizes information into files and stores them on disk. It divides each file into records, and each record into fields. For example, you might have a name and phone number file with 50 names and numbers (50 records) divided into three fields: last name, first name, and phone number.

Easydata uses sequential, rather than random-access files. This way, it's easier to use your data base files with other Basic programs, and to edit them with a word processor if you want.

To use Easydata, type in the Program Listing and save it with the command SAVE "EASYDATA". Then type in RUN "EASYDATA" from Basic. The main menu will appear on the screen, outlining your four options: creating a new file, reading an existing file, listing the files on disk, and quitting Easydata. Note that pressing the F key prints a directory of all files on disk. The command for this is in line 380 of the Program Listing. The "DIR" is for DOSPLUS and NEWDOS, while in TRSDOS, "DIR" must be changed to "D".

Creating a File

When creating a file, Easydata first asks you for a file name. If you don't supply an extension for the name, the program adds the default /DTA. If you don't supply a drive number, Easydata uses the drive number specified in line 85.

Then Easydata prompts you for the number of fields you want in each record and asks you to label each field. You can't change the number of fields once you've created a file.

Easydata automatically numbers each field within a record. If you had a record with fields for name, address, and phone number, for instance, it would appear as:

1. NAME:
2. ADDRESS:
3. PHONE:

The Key Box

Models I, III, and 4
48K RAM
Disk Basic
One disk drive
Printer (optional)

Program Listing. Easydata/BAS

```
10 CLEAR200:CLS:PRINTSTRING$(63,"*"):PRINT:PRINT
20 PRINT TAB(27);"EASYDATA":PRINT:PRINT
30 PRINT TAB(26);"VERSION 2.0":PRINT:PRINT
40 PRINT TAB(23);"BY ALAIN CIRKOVIC":PRINT:PRINT:PRINTSTRING$(63,"
*")
50 FOR X=1 TO 1000:NEXT
60 CLEAR 10000
70 DIM A$(9,200),I$(20)
80 MD=1 ' highest drive number
85 DF$="1" 'default drive for files
200 REM *** Main menu entry point ***
210 CLS
220 PRINT TAB(2)"(C) CREATE A NEW FILE"
230 PRINT TAB(2)"(R) READ AN EXISTING FILE"
240 PRINT TAB(2)"(F) FILES ON DISK"
250 PRINT TAB(2)"(Q) QUIT EASYDATA"
260 IF A$(1,0)="" THEN 310
270 PRINT TAB(2)"(E) EXTEND AN EXISTING FILE"
280 PRINT TAB(2)"(D) DISPLAY/EDIT/DEL./SEARCH "
290 PRINT TAB(2)"(S) SAVE FILE IN MEMORY"
300 PRINT TAB(2)"(P) PRINT/DISPLAY FILE"
310 YC$=INKEY$:IF YC$="" THEN 310
315 YC$=CHR$(ASC(YC$)AND 223)
320 YC=INSTR("CRFEDSPQ",YC$)
330 IF YC=0 THEN 210
340 IF YC=5 THEN 3000
350 IF YC=4 THEN 4000
360 IF YC=6 THEN GOSUB 6000:GOTO 210
370 IF YC=7 THEN GOTO 8000
380 IF YC=3 THEN CLS:INPUT"WHICH DRIVE";D:IF D>MD THEN 210 ELSE Q$
="DIR "+STR$(D):CMD Q$:LINEINPUT Q$:GOTO210
390 IF YC=8 THEN 15010
400 IF YC<>1 AND YC<>2 THEN 210
410 CLS
420 PM=0
500 REM *** Filename query ***
510 LINEINPUT"FILENAME: ";FL$:IF FL$="" THEN 210
520 IF INSTR(FL$,":")<>0 THEN  DN$=RIGHT$(FL$,1): FL$=LEFT$(FL$,LE
N(FL$)-2):ELSE DN$=DF$
530 IF INSTR(FL$,"/")=0 THEN FL$=FL$+"/DTA"
540 FL$=FL$+":"+DN$
550 CLS:PRINT"FILENAME: ";FL$
560 IF YC=2 THEN  GOTO 2000
570 INPUT"NUMBER OF ITEMS IN EACH  RECORD (# OF FIELDS)";NI
580 PRINT
590 FOR X=1 TO NI
600 PRINT"FIELD NAME #";X;:INPUT A$(X,0)
610 NEXT X
620 Y=1
630 GOSUB 1000
640 GOTO 210
1000 REM *** Create a new file ***
1010 CLS
1020 F=0:G=0:MAX=0
1100 REM *** Entry point for extend ***
1110 CLS:PRINT"RECORD #";Y:PRINT
1120 FOR X=1 TO NI
1130 PRINT A$(X,0);": ";:LINEINPUT" "; A$(X,Y)
1140 IF A$(X,Y)="END" OR A$(X,Y)="end" THEN X=NI:F=1
1150 NEXT X
1160 PRINT
1170 Q$="":INPUT"'ENTER' IF OK, 'E' TO EDIT";Q$
1180 IF Q$="E" THEN GOSUB5000:F=0
1190 Y=Y+1:G=G+1
1200 IF F=0 THEN GOTO 1110
1210 MAX=Y-2
1220 RETURN
2000 REM *** Reading in a file ***
2010 G=0
2020 OPEN "I",#1,FL$
2030 F=0:Y=0
2040 INPUT #1,NI
2050 FOR X=1 TO NI
2060 IF EOF(1) THEN X=NI:F=1:GOTO 2080
2070 LINEINPUT #1,A$(X,Y)
2080 NEXT X
2090 Y=Y+1
2100 IF F=0 THEN GOTO 2050
2110 CLOSE
2120 MAX=Y-2
2130 GOTO 210
3000 REM ***  Display routine  ***
3010 Y=1
```

Listing continued

Easydata uses these numbers later in the program during editing and printing.

After you type in each record, Easydata gives you the option of editing it. If you don't need to do so, you can continue with the next record.

When you've finished inputting data for the entire file, type in END and press the enter key. The program then displays an extended main menu that includes all the options mentioned above and four other commands: a command to extend the size of your data base, a Display command (with subcommands for record maintenance), a command to save the file to disk, and a command to print and display a record according to a format you define.

The Extend Command

The Extend command lets you add records to a file. It works identically to data entry in the Create mode. To Extend a file, first read the file into memory, and then type in E from the main menu.

Display Mode Commands

After reviewing this menu, you should first save your file with the S key. Then press the D key to get a sequential display of each record in the data base. In this mode, you can use the up- and down-arrows to scan through the file one record at a time. You can move easily from the beginning or end of the file by using shift/down-arrow keys (you may have to use shift/down-arrow and Z keys for the Models I and III), or shift/up-arrow keys.

In the Display mode, a list of subcommands appears below the record entry. They are Edit, Delete, Restore, Menu, Search, Get, Put, and #.

Edit lets you change the contents of any field. You can even edit the names you assigned a record's fields by using the # command to go to record #0, which displays the assigned field names.

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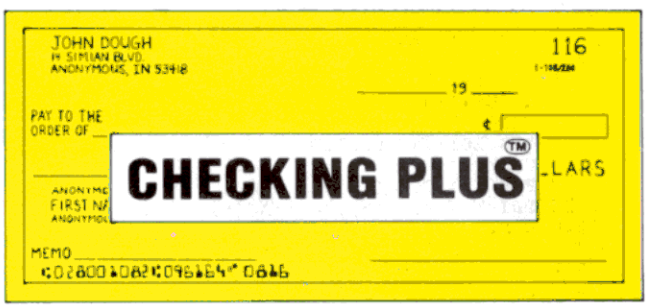

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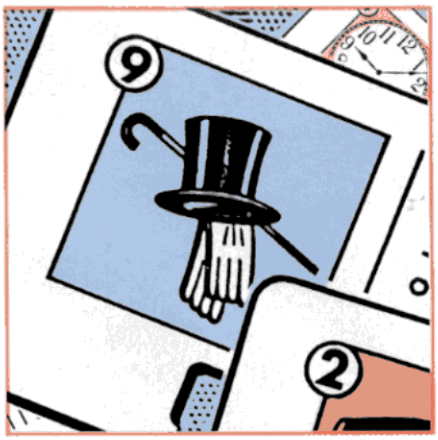
Listing continued

```
3020 CLS
3030 PRINT"RECORD #";Y;"    ";
3040 IF GR<>0 THEN PRINT"GET RECORD IS #";GR ELSE PRINT
3050 PRINT
3060 IF A$(0,Y)="X" THEN PRINT"*** DELETED RECORD ***":GOTO3120
3070 IF Y=MAX+1 THEN PRINT"*** END OF FILE ***":GOTO3120
3080 FOR X=1 TO NI
3090 PRINT A$(X,0);":  ";A$(X,Y)
3100 NEXT X
3110 PRINT:PRINT"COMMANDS: E,D,R,M,S,G,P,#"
3120 I$=INKEY$
3130 IF I$="" THEN 3120
3135 IF INSTR("edrmsgp",I$) THEN I$=CHR$(ASC(I$)AND 223)
3140 IF I$=CHR$(91) THEN Y=Y-1:IF Y<1 THEN Y=1
3150 IF I$=CHR$(10) THEN Y=Y+1
3160 IF I$="#" THEN INPUT"GO TO RECORD NUMBER";Y:IF Y<0 THEN Y=0
3170 IF Y>MAX+1 THEN Y=MAX+1
3180 IF Y=MAX+1 THEN 3240
3190 IF I$="E" THEN GOSUB5000
3200 IF I$="D" THEN 7000
3210 IF I$="R" THEN A$(0,Y)=""
3220 IF I$="M" THEN 210
3230 IF I$="S" THEN 10000
3240 IF I$="G" THEN GOSUB 11000
3250 IF I$="P" THEN GOSUB 11070
3260 IF I$=CHR$(27) THEN Y=1
3270 IF I$=CHR$(26) THEN Y=MAX
3280 GOTO 3020
3290 RETURN
4000 REM ***  Extend routine ***
4010 CLS
4020 Y=MAX+1:F=0
4030 GOSUB1110
4040 GOTO 210
5000 REM EDITING ROUTINE
5010 CLS
5020 FOR X=1 TO NI
5030 PRINT X;A$(X,0);": ";A$(X,Y)
5040 NEXT X
5050 PRINT:PRINT:PRINT"** EDITING MODE **"
5060 INPUT "CHANGE NUMBER (0 FOR DISPLAY)";EC
5070 IF EC<1 THEN RETURN
5080 IF EC>NI THEN 5060
5090 G=G+1:LINEINPUT"TO WHAT?";A$(EC,Y)
5100 GOTO 5000
6000 REM ***  Save routine ***
6010 CLS
6020 G=0:PRINT"PRESS 'ENTER' IF ";FL$;" IS CORRECT"
6030 PRINT:LINEINPUT"OR TYPE NEW FILENAME ";NF$
6040 IF NF$<>"" THEN FL$=NF$
6050 OPEN "O",#1,FL$
6060 PRINT #1,NI
6070 FOR Y=0 TO MAX
6080 IF A$(0,Y)="X" THEN 6120
6090 FOR X=1 TO NI
6100 PRINT #1,A$(X,Y)
6110 NEXT X
6120 NEXT Y
6130 CLOSE
6140 RETURN
7000 REM *** Delete record ***
7010 IF Y=0 THEN 3020
7020 I$=""
7030 CLS
7040 FOR X=1 TO NI
7050 PRINT X;A$(X,0);": ";A$(X,Y)
7060 NEXT X
7070 PRINT:PRINT:PRINT"** DELETE MODE **"
7080 Q$="":INPUT"ARE YOU SURE YOU WANT TO DELETE THIS RECORD(Y/N)"
;Q$
7090 IF LEFT$(Q$,1)<>"Y" AND LEFT$(Q$,1)<>"y" THEN 3020
7100 A$(0,Y)="X"
7110 G=G+1
7120 GOTO 3020
8000 REM *** Print/display records ***
8010 CLS
8020 OD$="":INPUT"PRINTER (P) OR SCREEN (S)";OD$
8030 IF OD$="P" OR OD$="p" THEN  OD=-2 ELSE OD=0
8040 CLS:PRINT"THESE ARE THE FIELDS:":PRINT
8050 FOR X=1 TO  NI
8060 PRINTX;A$(X,0)
8070 NEXT X
8080 PRINT:PRINT"# = FIELD NUM."
8090 PRINT"CR = CARRIAGE RETURN."
8100 PRINT"&>9 = TAB POSITION."
8110 PRINT"PRESS 'ENTER' WHEN FINISHED."
```

Listing continued



By then getting into the Edit mode, you can change the field labels.

Delete doesn't actually delete a record, but marks it so that it's ignored by the Print/Display and Save commands. You can restore a deleted record by moving to the deleted record (marked "Deleted Record") and pressing the R key. Once you save the file back to disk, however, the record is permanently deleted.

Search scans your file, looking for a string you typed in as the target. This command uses a substring search; for example, it locates the "ell" in "hello". You must type in exactly what you want to find, including capital letters. When Easydata finds a match, it displays the appropriate record. To search through the entire file, you must start at the beginning of the file. The search for the same target will continue if you press the enter key when you're prompted for the target.

The Get and Put commands let you move records. When moving a record, first go to the beginning of the record you want to move and type in G. The message "Get record is # NN" (where NN is the appropriate record number) appears at the top of the screen. Now move to the desired insert position. Press P and Easydata inserts the record just ahead of the one you're looking at. To put a record at the end of a file, move to the end-of-file marker and press P. If you want to cancel a Get command, move to the end of the file and press G.

The Print/Display Command

The only other command that requires explanation is Print/Display. This lets you format and print out or display selected fields of each record. When you select the Print/Display option from the main menu, you're shown each of the fields in the records of the file you're working on. The numbers of

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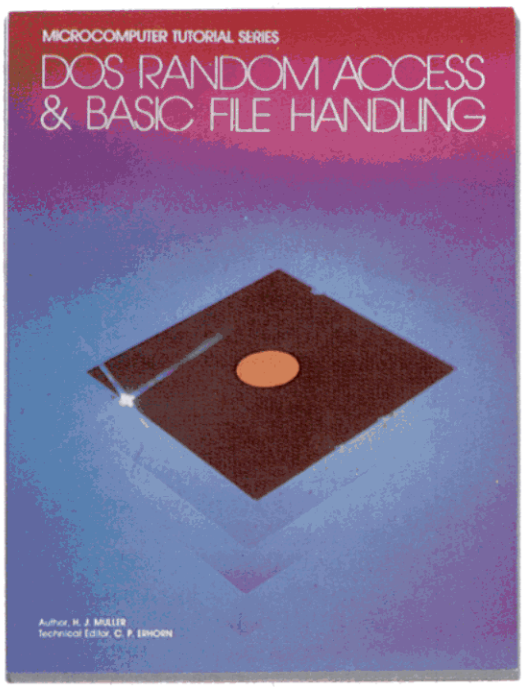

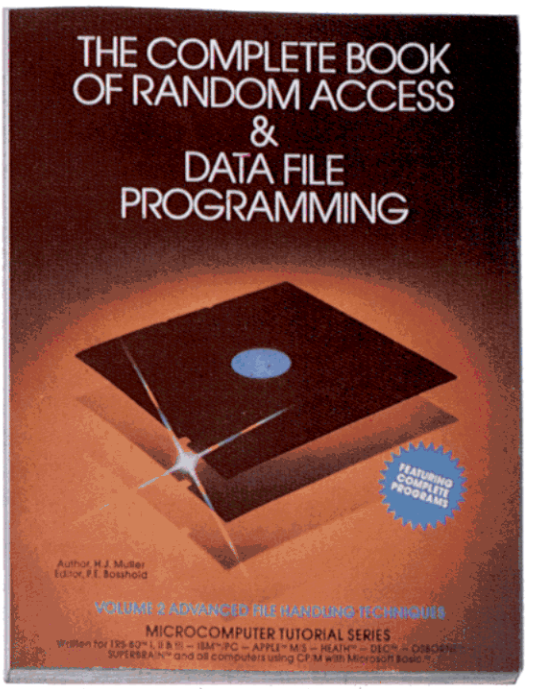

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Although random access file handling is a matter of some complexity, the subject has been treated in a simple and down-to-earth fashion, so that anyone with some small familiarity with programming in Microsoft BASIC will be able to cope with the material. Each stage of learning uses a sample program as a starting point. The programs grow in capability and complexity as the books progress into all of the various aspects of file handling and record manipulation. An extensive effort has been made to keep the material coherent and every program line is explained in detail.

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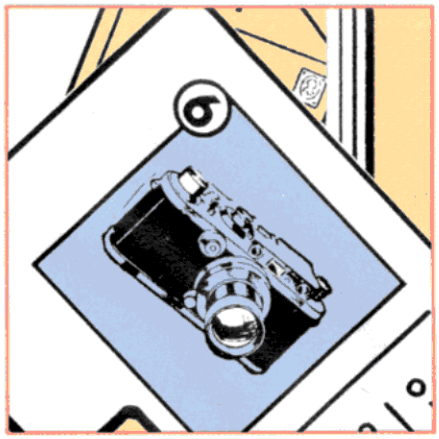
Listing continued

```
8120 PRINT
8130 IF PM>0 THEN PRINT"Control String is ";:FOR I=1 TO PM:PRINT I
$(I);" ";:NEXT I
8140 P=1
8150 I$="":INPUT I$
8160 IF I$="" AND P=1 THEN 8220
8170 I$(P)=I$
8180 IF I$(P)="" THEN  8210
8190 P=P+1
8195 IF P=19 THEN PRINT"Only 1 more response left" ELSE IF P=20 TH
EN 8210
8200 GOTO 8150
8210 PM=P-1
8220 PRINT:PRINT"ENTER to print all records,"
8230 SE$="":INPUT"'S' to select";SE$
8240 IF SE$="S" OR SE$="s" THEN GOSUB 9000
8250 CLS
8260 FOR Y=1 TO MAX
8270 IF SE$="S" OR SE$="s" THEN GOSUB 12000 ELSE T=1
8280 IF T=0 THEN 8400
8290 IF A$(0,Y)="X" THEN  8400
8300 FOR P=1 TO PM
8305 IF OD=-2 THEN GOSUB 8500
8310 IF I$(P)="CR" THEN PRINT:GOTO 8360
8320 V=VAL(I$(P)):IF V<0 THEN V=0
8330 IF V=0 THEN PRINT I$(P);:GOTO8360
8340 IF V>9 THEN PRINT TAB(V);:GOTO 8360
8350 PRINT A$(V,Y);" ";
8360 NEXT P
8370 Q$=INKEY$
8380 IF OD=0 AND Q$="" THEN 8370
8390 IF Q$="M" OR Q$="m" THEN Y=MAX:Q$=""
8400 NEXT Y
8410 IF OD=0 THEN PRINT:PRINT"** END OF FILE **":LINEINPUT Q$
8420 GOTO 210
8500 '*** Send output to printer ***
8510 IF I$(P)="CR" THEN LPRINT" ":GOTO 8560
8520 V=VAL(I$(P)):IF V<0 THEN V=0
8530 IF V=0 THEN LPRINTI$(P);:GOTO8560
8540 IF V>9 THEN LPRINT TAB(V);:GOTO 8560
8550 LPRINT A$(V,Y);" ";
8560 RETURN
9000 REM *** Set up conditions ***
9010 CLS
9020 FOR X=1 TO NI:PRINT X;A$(X,0):NEXT X:PRINT
9030 FOR J=1 TO 3
9040 F(J)=0:C$(J)="":S$(J)=""
9050 NEXT J
9060 L1$="":L2$=""
9070 JJ=0
9080 FOR J=1 TO 3
9090 JJ=JJ+1
9100 INPUT"FIELD";F(J):IF F(J)<1 THEN F(J)=1 ELSE IF F(J)>NI THEN
F(J)=NI
9110 INPUT"CONDITION (=,#,>,<)";C$(J)
9120 IF INSTR("=#<>",C$(J))=0 THEN 9110
9130 INPUT"COMPARE WITH";S$(J)
9140 IF J=1 THEN INPUT"CONNECTIVE (AND/OR)";L1$
9150 IF L1$="" THEN J=3:GOTO9190
9160 IF L1$<>"AND" AND L1$<>"OR" THEN 9140
9170 IF J=2 THEN INPUT"CONNECTIVE (AND/OR)";L2$:IF L2$="" THEN J=3
:GOTO9190
9180 IF J=2 THEN IF L2$<>"AND" AND L2$<>"OR" THEN 9170
9190 PRINT:NEXT J
9200 RETURN
10000 REM **** Search routine ***
10010 PRINT:PRINT:PRINT"** SEARCH MODE **"
10020 PRINT"TARGET = ";T$
10030 INPUT"NEW TARGET";NT$
10040 IF NT$<>"" THEN T$=NT$
10050 Y=Y+1:IF Y>MAX THEN Y=MAX:PRINT"NOT FOUND":FOR J=1 TO 700:NE
XT J:GOTO 3020
10060 FLAG=0
10070 FOR X=1 TO NI
10080 IF INSTR(A$(X,Y),T$)<>0 THEN X=NI:FLAG=1
10090 NEXT X
10100 IF FLAG=0 THEN 10050
10110 GOTO 3020
11000 REM *** Get & put ***
11010 IF Y=MAX+1 THEN GR=0:RETURN
11020 GR=Y
11030 FOR X=0 TO NI
11040 TEMP$(X)= A$(X,Y)
11050 NEXT X
11060 RETURN
```

Listing continued on p. 82



the fields are also displayed. Then you're asked to develop a print control string. The print control string controls the order in which Easydata prints a record's fields and where they end up on paper or the screen. Type in the elements of this string one item at a time, pressing the enter key after each item.

Easydata will prompt you to enter the first field number you want printed. You enter a number from zero to nine to specify the field, a number above nine to tab to a specific column (tabs beyond 64 won't work properly on the Model I), a carriage return (CR) to start a new line, or any text string you want printed as is; you must enclose the string in quotes if it contains commas, semicolons, or colons. After typing in the print control string, hit the enter key twice (once for the last item, and once to initiate the actual printing).

For example, say you have a record that appears as:

1. LAST NAME: Smith
2. FIRST NAME: John
3. CITY: Westmount, Quebec
4. POSTAL CODE: H5J 2J5
5. PHONE: 555-1234

When you answer the question-mark prompts in the Print/Display mode with 2, 1, 15, "Phone:", 5, CR, 4, CR, the printout will appear as:

John Smith Phone: 555-1234
H5J 2J5

When printing the results, output is continuous until the end of the file. If you want the results displayed on screen, however, you'll have to press the enter key to display each new record. In either case, pressing and holding the M key returns you to the main menu.

Easydata lets you reuse the same print control string as often as you like. To do so, press the enter key when you're asked to supply a new print con-

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7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
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10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
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13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
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37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAPI	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
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trol string. After selecting the print format parameters, you're asked to press the enter key if you want to print or display the entire file, or to select (S) certain portions of the file.

If you choose to display or print only certain sections of the file, Easydata displays a new set of prompts to selectively retrieve only specified files. You can specify search parameters with the following three criteria: field, condition, and comparison. First, you're asked to type in the number of the field you want used for comparison. Then you have to specify one of the following conditional elements: equal to, not equal to, less than, and greater than. Note that comparisons based on numbers must have the same number of digits as all items are stored in strings.

Finally, you're asked to specify the string that Easydata will use for comparison. To enter a null string, type in " ". The connectives And and Or let you join the criterion so that you can make your selections as specific as you want. When you're finished inputting, press the enter key to start the selection process.

Final Notes

Easydata does place limitations on the size of files and records. A file can hold a total of 10,000 characters, consisting of a maximum of 200 records with nine fields in each. Any item can be up to 200 characters long. If you need more record space you can change the DIM A$(9,200) in line 70 of the Program Listing. This only works if you have very few fields. For example, if you have four fields in 400 records, you could change DIM A$(9,200) to DIM A$(4,400) to gain space to increase the number of records.

You can adapt Easydata to other machines. If you want to use another machine, watch the Program Listing for these crucial lines: the file opening commands in lines 2020 and 6050; the directory command in line 380, the values returned by the arrow keys in lines 3140, 3150, 3260, and 3270; and the printing routine in lines 8500–8560.

To use Easydata in Model 4 mode, change line 3140 from CHR$(91) to CHR$(11), and line 380 from CMD Q$ to System Q$. ■

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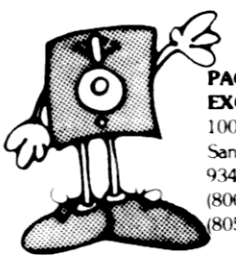
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Listing continued from p. 78

```
11070 PR=Y
11080 IF GR=0 OR PR=0 OR GR=PR THEN RETURN
11090 G=G+1
11100 IF GR>PR THEN 11210
11110 FOR Y=GR TO PR-2
11120 FOR X=0 TO NI
11130 A$(X,Y) = A$(X,Y+1)
11140 NEXT X
11150 NEXT Y
11160 FOR X=0 TO NI
11170 A$(X,PR-1)=TEMP$(X)
11180 NEXT X
11190 GR=0
11200 RETURN
11210 FOR Y=GR TO  PR+1 STEP -1
11220 FOR X=0 TO NI
11230 A$(X,Y) = A$(X,Y-1)
11240 NEXT X
11250 NEXT Y
11260 FOR X=0 TO NI
11270 A$(X,PR)=TEMP$(X)
11280 NEXT X
11290 GR=0
11300 RETURN
12000 REM *** Select records to print ***
12010 FOR J=1 TO 3:T(J)=0:NEXT J
12020 T=0
12030 FOR J=1 TO JJ
12040 ON INSTR("=#><",C$(J)) GOTO 12060,12070,12080,12090
12050 UC=1:J=3:GOTO12100
12060 IF S$(J)=A$(F(J),Y) THEN T(J)=1:GOTO12100 ELSE 12100
12070 IF S$(J)<>A$(F(J),Y) THEN T(J)=1:GOTO12100 ELSE 12100
12080 IF S$(J)<A$(F(J),Y) THEN T(J)=1:GOTO12100 ELSE 12100
12090 IF S$(J)>A$(F(J),Y) THEN T(J)=1
12100 NEXT J
12110 IF UC=1 THEN UC=0:PRINT"UNKNOWN CONDITION":RETURN
12120 IF L1$="" THEN T=T(1):RETURN
12130 IF L2$="" THEN T(3)=1:IF L1$="AND" THEN L=1:GOTO 12160 ELSE
      IF L1$="OR" THEN L=9:GOTO12160
12140 L$=L1$+L2$
12150 L=INSTR("ANDANDORORAND",L$)
12160 IF L=1 THEN 12180 ELSE IF L=4 THEN 12190 ELSE IF L=7 THEN 12
200 ELSE IF L=9 THEN 12210
12170 PRINT"UNKNOWN LOGIC":RETURN
12180 IF (T(1)=1 AND T(2)=1) AND T(3)=1 THEN T=1:RETURN ELSE T=0:R
ETURN
12190 IF (T(1)=1 AND T(2)=1) OR T(3)=1 THEN T=1:RETURN ELSE T=0:RE
TURN
12200 IF (T(1)=1 OR T(2)=1) OR T(3)=1 THEN T=1:RETURN ELSE T=0:RET
URN
12210 IF (T(1)=1 OR T(2)=1) AND T(3)=1 THEN T=1:RETURN ELSE T=0:RE
TURN
15000 REM *** Exit routine ***
15010 CLS
15020 IF G=0 THEN END
15030 PRINT"YOU HAVE MADE ";G;" CHANGES."
15040 INPUT"DO YOU WANT TO SAVE THE FILE";A$
15050 IF LEFT$(A$,1)="Y" OR LEFT$(A$,1)="y" THEN GOSUB 6000
```

End

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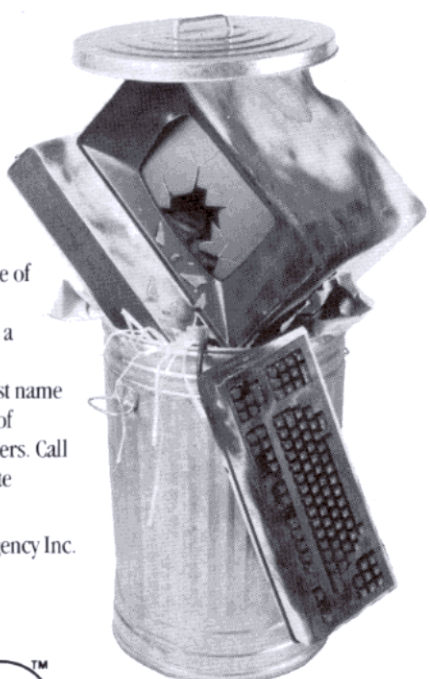

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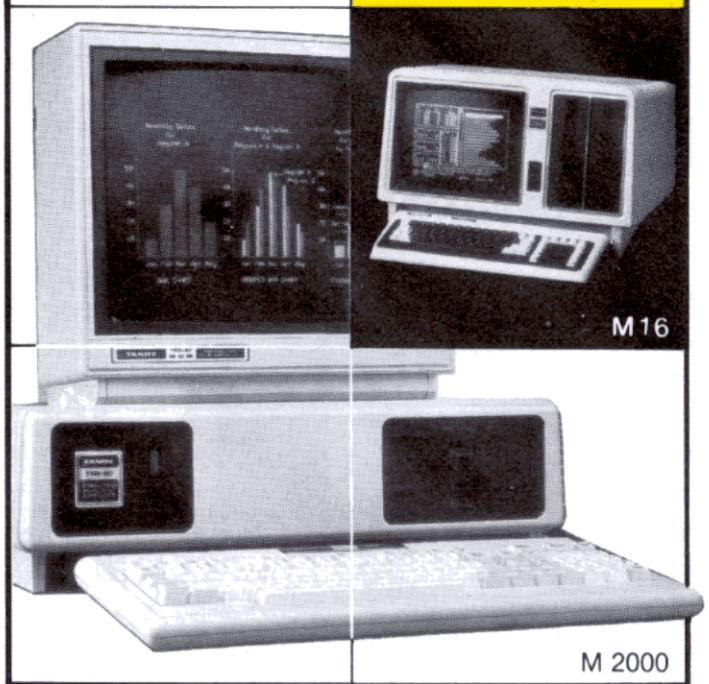

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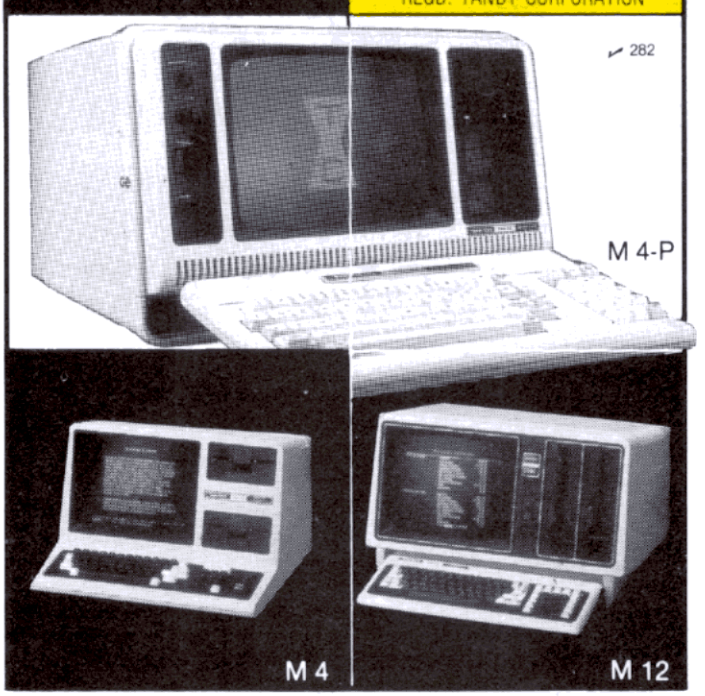

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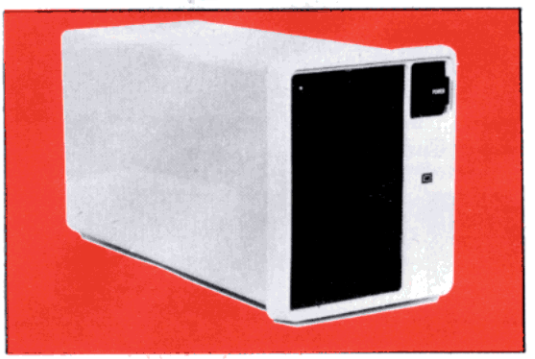

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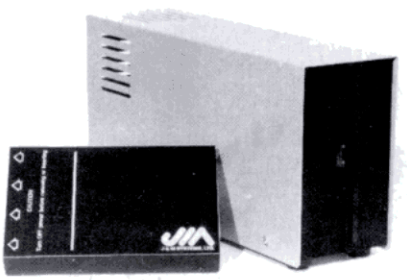

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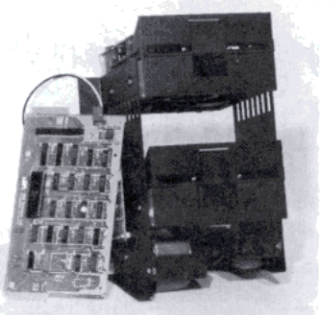

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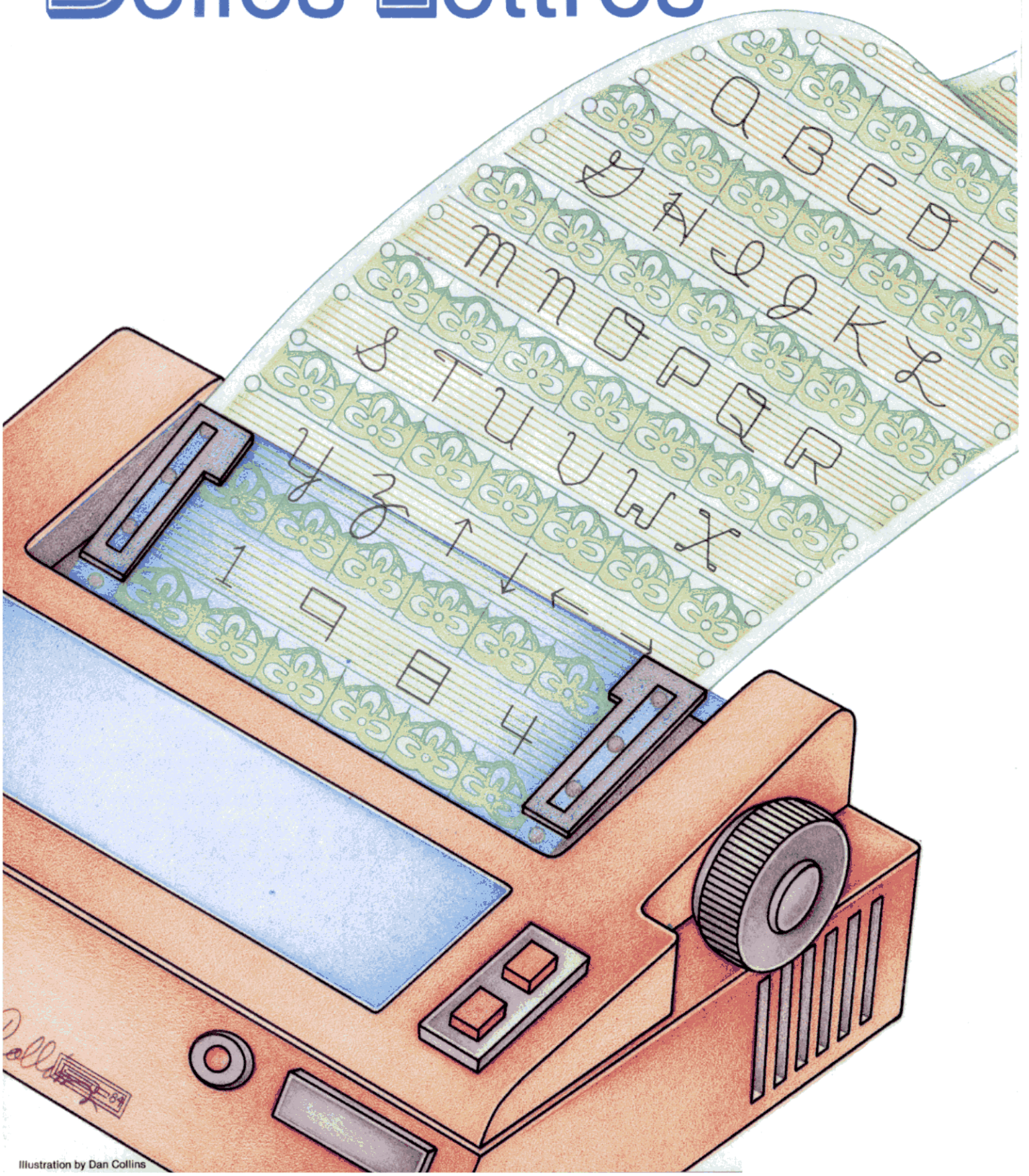


Illustration by Dan Collins

Design your own character fonts and print out letters, graphics characters, and symbols in standard or double width.

by Joseph Gaudreau

One advantage of a daisy-wheel printer is that you can use different print fonts to give your documents a distinctive, professional look. Those of us with dot-matrix printers haven't had that option—until now. I wrote a Model I/III program that lets you design your own character sets and print them out in either standard-size or enlarged font (see Figs. 1–3). You can create any type of character you want, from letters to language symbols to high-resolution graphics characters.

System Requirements

To use the custom character generator, you need an Epson MX series printer with any version of Graftrax and a 48K Model I or III. I'll discuss how to convert the main printer driver and editor programs for other graphics printers later.

You can use these programs with any software that has a ROM-based character driver. They won't run with a program that has its own character driver, such as Scripsit, but you can change disk Scripsit so that it accepts an alternate character driver (see the Scripsit documentation). These programs work without modification on Electric Pencil or Lazywriter.

I used NEWDOS80 2.0 to run the character editor programs. Conversion to other DOSes is easy if your DOS lets you dump main memory from Basic to disk—simply rewrite the Save portion of the editor.

If your DOS doesn't let you dump main memory from Basic, go to DOS Ready after you create your character set. You can compute the size of the set with the formula 57364 + 512*(character width), and save it using the Dump command. This also works with tape or stringy floppy systems.

The Programs

Standard/EDT and Standard/DVR (Program Listings 1 and 2) are, respectively, the editor and driver programs

Figure 1. An example of the script print style.

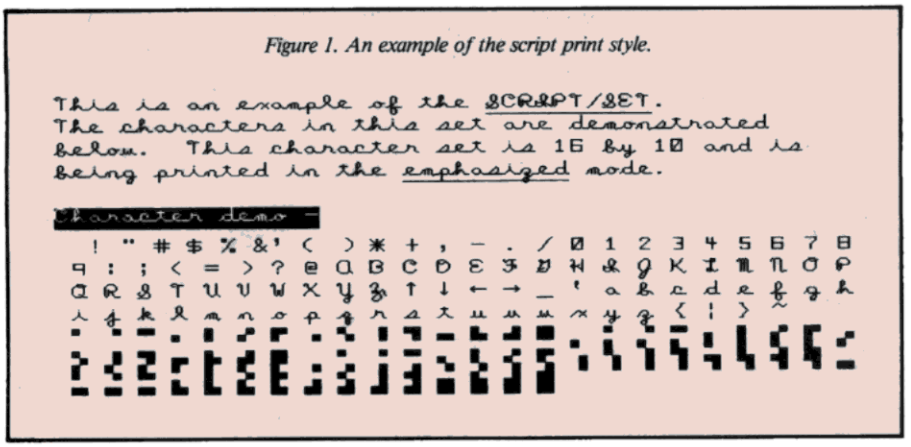


Figure 2. An example of the digital print style.

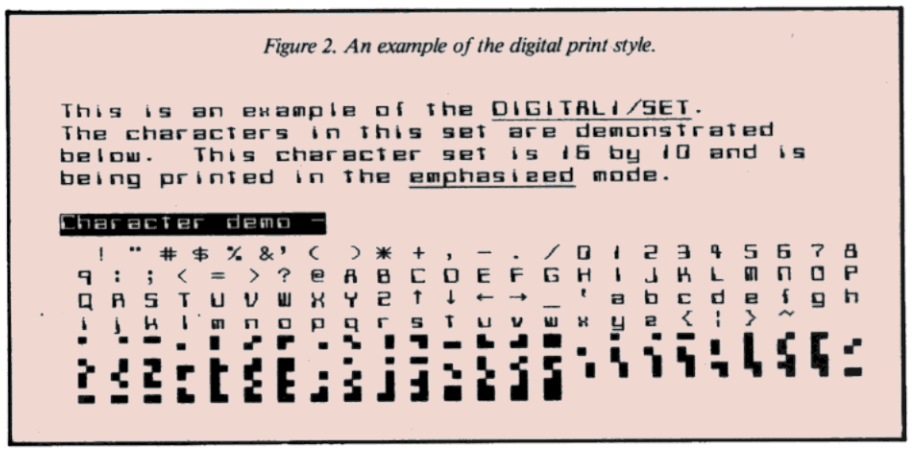
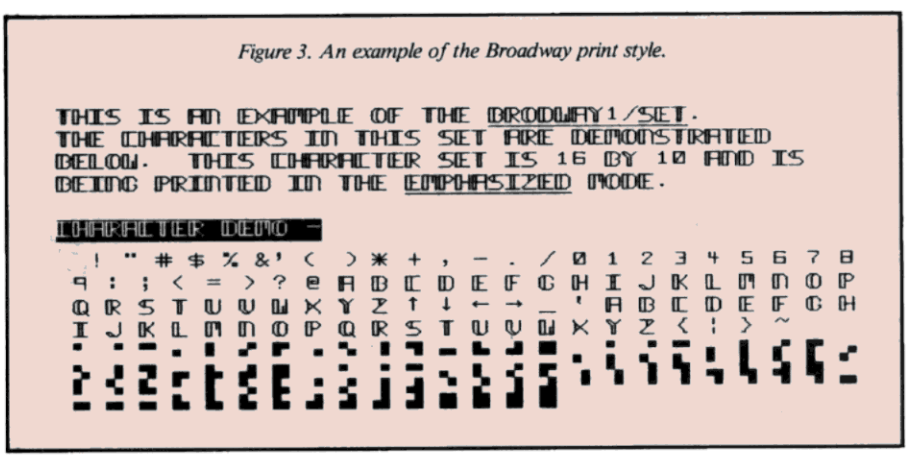


Figure 3. An example of the Broadway print style.



for printing standard-size characters (8 by 6 pixels). The character driver lets you create a character set, but with the standard number of characters per line and lines per page.

Double/EDT and Double/DVR (Program Listings 3 and 4) are the editor and driver programs for creating emphasized characters twice the normal size (16 by 12 pixels). Program Listing 4 has a 16- by n-pixel matrix, and requires two passes of the print head to print one line of characters. The first pass prints the top half of the line and the second pass prints the bottom eight dots. The character width is variable and depends on the type of characters you design.

The driver programs in Listings 2 and 4 automatically recognize the difference between the two print sizes. You can change the number of characters per line from DOS, Basic, or Assembly language, and you can have between one and the maximum character count per line.

The computer calculates the maximum character count per line by dividing the character width into 480. You can vary the spacing between lines, usually by 8/72 of an inch, from 1/72 of an inch to the maximum value your printer allows.

Using the Editor

Both editor programs operate similarly. To run either editor, start from DOS Ready, run the driver program for the desired editor, and enter Disk Basic. Then load and run the corresponding editor program.

The editor will present a list of menu options and display random characters in the lower right-hand corner to prompt your input and to indicate that the program is running.

The main menu in Listing 1 offers six options. Which option you choose depends on whether you're creating a character set or editing an old one.

Creating a Character Set

To create a character set, clear character memory (option 3) and enter the creation routine (option 6). A blinking cursor will appear in a window in the upper left-hand corner of the screen. You create and edit characters within this window.

Use the arrow keys to move the cursor around the edit window. You "draw" your character with two keys: The S key sets the pixel at the cursor's current location, and the R key resets the pixel under the cursor.

The clear key clears the edit window. You can use this to erase the current character and start over again from scratch.

Once you've finished creating a character, save it by pressing the T key. The T key invokes the Take subcommand and saves the character you designed. The Take command (and option 5) require a specific input form. By entering a 1-byte response representing the character you want (e.g., A, 8, or *), you can save the edit window to that character.

Entering a 2- or 3-byte number representing the ASCII value of the character also works, and it's useful for saving the edit window to a character you can't enter from the keyboard (for example, codes 0–31, the graphics characters, arrows, and so on). You can use any number from 0–255, as long as you put them in the correct locations.

Once the program saves your character, clear the window to continue.

The Key Box

LOAD 80

Models I and III
48K RAM
Disk Basic
Assembly Language
NEWDOS80 2.0
Editor/Assembler
Epson MX-80 with Graftrax

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Program Listing 1. Standard/EDT, the editor for the standard-size character driver.

```
100 ' Shape Editor for Char Set II -
     by Joseph Gaudreau on June 24, 1983.
       For the Model I TRS-80 with Newdos/80 and an
       Epson Mx-80 with Graftrax +.


110 CMD"T":CLEAR5000
120 CLS:ONERRORGOTO0:DEFINTA-Z:DIMZ(256,5),V(8)
130 XQ=12:YQ=11:W=16
140 PRINTTAB(W+10);"E D I T O R  -- I I"
150 PRINTTAB(W)"<1> Load a previously created character set."
160 PRINTTAB(W)"<2> Save the character set in memory."
170 PRINTTAB(W)"<3> Clear character buffer."
180 PRINTTAB(W)"<4> Print character set in memory."
190 PRINTTAB(W)"<5> Display a character (ASCII/by character)."
200 PRINTTAB(W)"<6> Edit character displayed in windpw."
210 FORN=11TO24:SET(N,10):SET(N,19):NEXT
220 FORN=11TO18:SET(11,N):SET(24,N):NEXT
230 FORJ=0TO7:V(J)=2[(7-J):NEXT
240 '-=*=-
250 POKE16383,RND(254):IFPEEK(14463)=0THEN250ELSEA$=INKEY$
260 POKE16383,32:IFA$<"1"ORA$>"6"THEN250
270 A=VAL(A$):ONAGOTO300,360,750,900,810,580
280 :
290 '-=*=-  LOAD DATA -=*=-
300 PRINT@640,"Filename - ???  ";
310 LINEINPUTF$:CMD"LOAD "+F$
320 FORN=0TO255:T=N*6-4096:FORJ=0TO5
330 Z(N,J)=PEEK(T+J):NEXT:NEXT
340 PRINT"File loaded and converted.
Press <SPACE> to continue.";:GOSUB420:GOTO250
350 '-=*=-  SAVE DATA -=*=-
360 PRINT@640,"Filename - ??? ";
370 LINEINPUTF$
380 FORN=0TO255:T=N*6-4096:FORJ=0TO5
390 POKET+J,Z(N,J):NEXT:NEXT
400 CMD"DUMP "+F$+",F000H,F5FFH,402DH"
410 PRINT"File converted and saved.
Press <SPACE> to continue.":GOSUB420:GOTO250
420 POKE16383,RND(254):IFPEEK(14463)=0THEN420ELSEPRINT@448,CHR$(
31);
430 RETURN
440 '-=*=-  EDIT DATA IN WINDOW -=*=-
450 YD=0:XD=0:W=PEEK(14400):IFW=0THEN600
460 IFWAND8THENYD=-1
470 IFWAND16THENYD=1
480 IFWAND32THENXD=-2
490 IFWAND64THENXD=2
500 IFWAND2THEN510ELSE520
510 FORN=12TO23:FORO=11TO18:RESET(N,O):NEXT:NEXT:B=0:GOTO590
520 IFWAND1THENGOSUB420:GOTO250
530 IFYD=0ANDXD=0THEN590
540 IFB=0THENRESET(XQ,YO):RESET(XQ+1,YO)ELSEB=0
550 XQ=XQ+XD:YQ=YQ+YD
560 IFXQ<12THENXQ=12ELSEIFXQ>22THENXO=22
570 IFYQ<11THENYQ=11ELSEIFYQ>18THENYQ=18
580 IFPOINT(XQ,YQ)=-1THENB=1
590 RESET(XQ,YQ):FORTT=1TO20:NEXT:SET(XQ,YQ):GOTO450
600 W=PEEK(14340):IFW=0THEN590
610 IFW=4THENB=0:GOTO540
620 IFW=8THENSET(XQ,YQ):SET(XQ+1,YQ):B=1
630 IFW=16THEN640ELSE450
640 PRINT@586,"";:LINEINPUT"Save to what character (Letter/ASCII
) ??? ";L$
650 IFLEN(L$)=1THENSN=ASC(L$)ELSESN=VAL(L$)
660 PRINT@648,"Saving under ASCII number";SN;"-->";
670 POKE16042,ABS(SN)
680 PRINT@532,"";:IFB=0THENRESET(XQ,YQ)
690 FORX=12TO22STEP2:E=0:FORY=11TO18
700 IFPOINT(X,Y)=-1THENE=E+V(Y-11)
710 NEXT
720 PRINTE;:Z(SN,X/2-6)=E
730 NEXT:GOSUB420:GOTO450
740 '-=*=-  CLEAR BUFFER -=*=-
750 PRINT@458,"Are you really sure ?? (Y/N)";
760 IFPEEK(14463)=0THEN760ELSEA$=INKEY$
770 IFA$="Y"THEN790ELSEIFA$<>"N"THEN760
780 GOSUB420:GOTO250
790 FORN=0TO255:FORO=0TO5:Z(N,O)=0:NEXT:NEXT:GOTO780
800 '-=*=- DISPLAY A SINGLE CHARACTER -=*=-
810 PRINT@522,"";:LINEINPUT"Load what character ??? ";L$
820 IFLEN(L$)=1THENSN=ASC(L$)ELSESN=VAL(L$)
830 FORN=12TO23:FORO=11TO18:RESET(N,O):NEXT:NEXT
840 FORX=12TO22STEP2:FORY=0TO7
850 IFZ(SN,X/2-6)ANDV(Y)THEN860ELSE870
860 SET(X,Y+11):SET(X+1,Y+11)
```

Listing 1 continued

To save the character set, return to the main menu by pressing the enter key. Then select option 2, name the character set, and save it to disk. Stringy floppy users can convert the save and load features without any trouble.

Editing a Character

Use option 1 to load an existing character set from disk. Use option 6 to edit characters in the edit window.

Use the arrow keys to move the flashing cursor inside the edit window. You can change the shape of the character using the S and R keys to set and reset the pixels as before. The T key saves your edited character.

Other Options

Option 2 saves the character set currently in the buffer to disk. Option 3 clears the memory buffer.

Option 4 prints out the current character set for inspection. It's difficult to judge character size or shape in the edit window; a printout is a better way to critically assess the final product.

Option 5 loads a character into a small edit window on the screen and asks you what character you want the computer to display. Press the key for the desired character to appear in the window.

The emphasized-character editor in Listing 3 has an additional option. Option 7 changes the width of all characters in a character set. You should use this command only when first running the editor. The legal values for width range from 1-14; the width routine rejects all others.

Design Hints

One good tip for designing characters is to use proper spacing. Leave at least one blank vertical line on the left or the right of a character to make sure letters aren't connected together at print time.

Also, design the character set on graph paper before entering it, and record any changes you want to make. Be careful near the bottom of the edit window because the underline routine uses the second line from the bottom and can change your character.

Figures 1, 2, and 3 contain examples of the kinds of print styles you can create. These figures show the script, digital, and Broadway character styles, respectively. Check the card catalog at your local library under "lettering" as another source of character sets. Also, many ads, products, signs, and other commercial displays have unusual types of lettering to convey a different mood or effect.

Standard-Character Driver

When first activated, the driver in Listing 2 sets memory size, changes the LPRINT vector, and jumps back to DOS. Whenever the program prints a character, the ROM driver loads it into the C register and jumps to the LPRINT routine. The driver initialization routine then changes the address of the LPRINT routine from 4026 hexadecimal (hex).

When you type in a control code, the program checks to determine whether or not the control code flag is set. If it is, the program prints a control character.

Control characters are E, F, Y, and Z. Lines 1300–1500 check for these letters and set or reset flags, depending on the control codes, and then return control to the caller. If the program doesn't recognize the character that it's printing as a code, it prints an ampersand (&) instead.

The driver recognizes the control codes &E, &F, &Y, and &Z. &E sets the dark print mode (960 dots per line). &F sets the defaults to the normal light mode. &Y activates the driver and alerts it to print all remaining text in your new alphabet. &Z deactivates the alternate alphabet and returns you to normal printer operation. The driver defaults to &Z on its first run.

Don't mix &E and &F or &Y and &Z on the same line; you might lock up the printer by exceeding the maximum count.

When the control code flag is inactive, the program determines whether or not it should set a control flag. The program returns to the calling routine when setting a flag. Otherwise, it assumes it has encountered an alphanumeric character and prints it.

Standard-Character Driver Routines

The driver reads a carriage return or a line feed as an alphanumeric character. Both characters tell the driver to print the character buffer. If the program doesn't print the buffer, it sends the character to the printer buffer or to the driver buffer in high memory.

The driver program controls this action with the AFLAG routine. When the driver sets the AFLAG to zero, the printer operates normally. The rest of the time, the alternate character set is active and the program sends the character to LETTS, the internal buffer.

The ALTSET routine stores the character in the buffer, increments the character count, and checks the maximum count. When the computer exceeds the

Listing 1 continued

```
870 NEXT:NEXT
880 GOSUB420:GOTO250
890 '-=*=-  PRINT CHARACTERS TO PRINTER FOR SAMPLE -=*=-
900 PRINT@458,"<N>ormal print or <E>mphasized ???"
910 IFPEEK(14463)=0THEN910ELSEA$=INKEY$
920 IFA$="N"THENLPRINT"&Y&F"ELSEIFA$="E"THENLPRINT"&Y&E"ELSE910
925 FORN=33TO37:LPRINTN;CHR$(N);" ";:NEXT:LPRINT
927 W=0:FORN=39TO127
929 LPRINTN;CHR$(N);" ";
931 W=W+1:IFW=9THENW=0:LPRINT
933 NEXT:LPRINT
1000 LPRINT"&Z":GOSUB420:GOTO250
1010 :
1020 ONERRORGOTO1020
1030 IFERL=310THENRESUME300
1040 RESUME1050
1050 END
```

End

Program Listing 2. Standard/DVR, the standard-size character driver.

```
                01000 ; Alternate Character Set Driver -
                01010 ; By Joseph Gaudreau on June 24, 1983 for 48k, Model I.
                01020 ;Allows use of different character sets on the Mx
                01030 ;series of printers with the Graftrax option.
                01040 ; Commands -
                01050 ; Control Code is a "&".
                01060 ; &E - Use emphasized mode when in alternate set.
                01070 ; &F - Use normal type when in alternate set.
                01080 ; &Y - Use alternate set.
                01090 ; &Z - Use normal printer set + commands, etc.
                01100 ;
                01110 ;
F000            01120 BUFFER  EQU     0F000H  ;Alternate character start
                01130 ;
F700            01140         ORG     0F700H
F700            01150 ZSTART  EQU     $
F700 210FF7     01160         LD      HL,START                ;Get driver start
F703 222640     01170         LD      (4026H),HL              ;Set printer DCB
F706 21FEEF     01180         LD      HL,BUFFER-2             ;HIMEM value
F709 224940     01190         LD      (4049H),HL              ;Set MEM-SIZE
F70C C32D40     01200         JP      402DH                   ;Back to DOS
                01210 ;
F70F            01220 START   EQU     $
F70F 3A3AF8     01230         LD      A,(CFLAG)               ;Get control flag
F712 B7         01240         OR      A                       ;Test flag
F713 2833       01250         JR      Z.CMDS                  ;Jump no control
F715            01260 CONTRL  EQU     $
F715 AF         01270         XOR     A                       ;A=0
F716 323AF8     01280         LD      (CFLAG),A               ;Reset flag
F719 79         01290         LD      A,C                     ;Get code
F71A            01300 EON     EQU     $
F71A FE45       01310         CP      'E'             ;Turn on EMPHASIZED mode?
F71C 2004       01320         JR      NZ.FOFF                 ;GO NO
F71E 323BF8     01330         LD      (EFLAG),A               ;Set yes
F721 C9         01340         RET                             ;To print caller
F722            01350 FOFF    EQU     $
F722 FE46       01360         CP      'F'             ;Emphasized mode off ??
F724 2005       01370         JR      NZ.YON                  ;GO NO
F726 AF         01380         XOR     A                       ;A=0
F727 323BF8     01390         LD      (EFLAG),A               ;Reset flag
F72A C9         01400         RET
F72B            01410 YON     EQU     $
F72B FE59       01420         CP      'Y'             ;Use alternate set ??
F72D 2004       01430         JR      NZ,ZOFF                 ;GO NO
F72F 3239F8     01440         LD      (AFLAG),A               ;Set yes
F732 C9         01450         RET
F733            01460 ZOFF    EQU     $
F733 FE5A       01470         CP      'Z'             ;Use normal printer cmds?
F735 200D       01480         JR      NZ.AMPER                ;GO NO
F737 AF         01490         XOR     A                       ;A=0
F738 3239F8     01500         LD      (AFLAG),A               ;Reset it
F73B E5         01510         PUSH    HL                      ;Zero count
F73C 210000     01520         LD      HL,0
F73F 223CF8     01530         LD      (COUNT),HL
F742 E1         01540         POP     HL
F743 C9         01550         RET
F744            01560 AMPER   EQU     $
F744 0E26       01570         LD      C,'&'                   ;Print a &
F746 1811       01580         JR      OKAY                    ;Proper mode
F748            01590 CMDS    EQU     $
F748 79         01600         LD      A,C                     ;Get letter
F749 FE26       01610         CP      '&'                     ;Control char?
F74B 2004       01620         JR      NZ,NOTC                 ;GO NO
F74D 323AF8     01630         LD      (CFLAG),A               ;Set flag
F750 C9         01640         RET
F751            01650 NOTC    EQU     $
F751 FE0D       01660         CP      13                      ;<ENTER> ??
F753 2825       01670         JR      Z.FULL                  ;GO YES
F755 FE0A       01680         CP      10                      ;<Line-Feed> ??
F757 2821       01690         JR      Z.FULL                  ;GO YES
F759            01700 OKAY    EQU     $
F759 3A39F8     01710         LD      A,(AFLAG)               ;Get print mode
F75C B7         01720         OR      A                       ;Test flag
F75D 2003       01730         JR      NZ.ALTSET               ;Jump mode type
```

Listing 2 continued

Listing 2 continued

```
F75F C329F8   01740          JP      LPRINT                  ;Normal let print
F762          01750 ALTSET   EQU     $
F762 E5       01760          PUSH    HL                      ;Save HL/DE
F763 D5       01770          PUSH    DE
F764 213EF8   01780          LD      HL,LETTS                ;Point to key buf
F767 ED5B3CF8 01790          LD      DE,(COUNT)              ;Get byte count
F76B 19       01800          ADD     HL,DE   ;Point (HL) to empty let spot
F76C 71       01810          LD      (HL).C                  ;Store byte
F76D 13       01820          INC     DE                      ;Next spot
F76E ED533CF8 01830          LD      (COUNT),DE              ;Restore count
F772 7B       01840          LD      A,E                     ;Get LSB of count
F773 FE4E     01850          CP      78                      ;End line yet??
F775 2817     01860          JR      Z.PRIBUG                ;GO YES
F777 D1       01870          POP     DE                      ;Restore regs
F778 E1       01880          POP     HL
F779 C9       01890          RET
F77A          01900 FULL     EQU     $
F77A 3A39F8   01910          LD      A,(AFLAG)               ;Get print mode
F77D B7       01920          OR      A                       ;Test flag
F77E 2003     01930          JR      NZ,FULL2                ;Jump mode type
F780 C329F8   01940          JP      LPRINT                  ;Normal LF/ENTER
F783          01950 FULL2    EQU     $
F783 ED5B3CF8 01960          LD      DE,(COUNT)              ;Test count zero
F787 7A       01970          LD      A,D
F788 B3       01980          OR      E
F789 CA29F8   01990          JP      Z.LPRINT
F78C 1802     02000          JR      PRIBUF
F78E          02010 PRIBUG   EQU     $
F78E D1       02020          POP     DE      ;Restore regs from abort exit up
F78F E1       02030          POP     HL
F790          02040 PRIBUF   EQU     $
F790 F5       02050          PUSH    AF                      ;Save regs
F791 D5       02060          PUSH    DE
F792 E5       02070          PUSH    HL
F793 C5       02080          PUSH    BC
F794 DDE5     02090          PUSH    IX
F796 3A3BF8   02100          LD      A,(EFLAG)               ;Get print type
F799 B7       02110          OR      A                       ;Test flag
F79A 200C     02120          JR      NZ,NINE60               ;Jump big mode
F79C          02130 FOUR80   EQU     $
F79C 3E4B     02140          LD      A,'K'                   ;480 Med-rez mode
F79E 32D1F7   02150          LD      (WHATM+1),A             ;Set it
F7A1 3E00     02160          LD      A,0                     ;Byte count
F7A3 320AF8   02170          LD      (WHATC+1),A             ;Set it
F7A6 180A     02180          JR      DOIT                    ;Yea !!!
F7A8          02190 NINE60   EQU     $
F7A8 3E4C     02200          LD      A,'L'                   ;980 hi-rez mode
F7AA 32D1F7   02210          LD      (WHATM+1),A             ;Set it
F7AD 3E01     02220          LD      A,1                     ;Byte count
F7AF 320AF8   02230          LD      (WHATC+1),A             ;Set it
F7B2          02240 DOIT     EQU     $
F7B2 ED5B3CF8 02250          LD      DE,(COUNT)              ;Get line-len
              02260 ; Nifty little routine to multiply DE by 6 :
F7B6 D5       02270          PUSH    DE                      ;HL=DE
F7B7 E1       02280          POP     HL
F7B8 29       02290          ADD     HL,HL                   ;DE*2
F7B9 29       02300          ADD     HL,HL                   ;DE*4
F7BA 19       02310          ADD     HL,DE                   ;DE*5
F7BB 19       02320          ADD     HL,DE                   ;DE*6
F7BC 3A3BF8   02330          LD      A,(EFLAG)               ;Get print mode
F7BF B7       02340          OR      A                       ;Test for mode
F7C0 2801     02350          JR      Z.F80                   ;Jump if 480 mode
F7C2 29       02360          ADD     HL,HL                   ;DE*12
F7C3 7D       02370 F80      LD      A,L                     ;Get LSB
F7C4 32D6F7   02380          LD      (LSB+1),A               ;SET
F7C7 7C       02390          LD      A,H                     ;MSB
F7C8 32DBF7   02400          LD      (MSB+1),A               ;ALSO TOO
              02410 ; This little bit "kicks" Mx-80 into grafix mode -
F7CB          02420 MODE     EQU     $
F7CB 0E1B     02430          LD      C,27                    ;<CTL>
F7CD CD29F8   02440          CALL    LPRINT
F7D0 0E00     02450 WHATM    LD      C,0     ;Filled with K or L above
F7D2 CD29F8   02460          CALL    LPRINT
F7D5 0E00     02470 LSB      LD      C,0     ;Filled with count above
F7D7 CD29F8   02480          CALL    LPRINT
F7DA 0E00     02490 MSB      LD      C,0     ;DITTO
F7DC CD29F8   02500          CALL    LPRINT
              02510 ;
F7DF DD213EF8 02520          LD      IX,LETTS        ;Point to print buffer -
F7E3          02530 LOOP     EQU     $
F7E3 ED5B3CF8 02540          LD      DE,(COUNT)              ;Get letrs left
F7E7 7A       02550          LD      A,D                     ;=0 yet??
F7E8 B3       02560          OR      E
F7E9 282B     02570          JR      Z,DONE                  ;Go yes
F7EB 1B       02580          DEC     DE                      ;-1 on count
F7EC ED533CF8 02590          LD      (COUNT),DE              ;Save count
              02600 ;
F7F0 DD7E00   02610          LD      A,(IX)                  ;Get a letter
F7F3 DD23     02620          INC     IX                      ;Next letter
F7F5 2100F0   02630          LD      HL,BUFFER               ;Point to alts
F7F8 110600   02640          LD      DE,6                    ;Offset mult/add
F7FB          02650 LP1      EQU     $
F7FB B7       02660          OR      A                       ;Done yet?
F7FC 2804     02670          JR      Z.MULTD                 ;Go mult done
F7FE 19       02680          ADD     HL,DE                   ;Add offset
F7FF 3D       02690          DEC     A                       ;-1 on count
F800 18F9     02700          JR      LP1
F802          02710 MULTD    EQU     $
F802 0606     02720          LD      B,6                     ;6 bytes to print
F804          02730 LP2      EQU     $
F804 4E       02740          LD      C,(HL)                  ;Get letter
F805 23       02750          INC     HL                      ;Next
F806 CD29F8   02760          CALL    LPRINT                  ;Print byte
F809 3E00     02770 WHATC    LD      A,0                     ;Get 6/12 mode
F80B B7       02780          OR      A                       ;Test mode
```

Listing 2 continued

maximum count, the buffer automatically prints out its contents.

The Full routine determines program mode and sends a line feed or a carriage return to the printer or prints the buffer. Then PRIBUF prints the contents of the buffer (unless it's empty).

PRIBUF saves all registers that you can change or modify. The program determines the current mode (480 or 960 dots per line) by checking the EFLAG and loads values depending on the mode in effect.

The program then calculates how many dots to print on a line by multiplying the character width (6 pixels) by the number of characters in the buffer. When the computer selects the 960 mode, the value in the buffer doubles.

The program enters the printer graphics mode by sending the escape code (27), a K or an L (mode-dependent), and the dot count in least significant byte/most significant byte (LSB/MSB) format. Register IX points to the LETTS buffer. PRIBUF's main loop is named Loop. The Count buffer holds the character count and decreases it by one as the program prints each character.

The IX register points to the character buffer, register A holds the ASCII value of that character, and HL points to the buffer storing the bits for each character.

Since each letter is six dots wide, the program needs a routine to multiply the ASCII value by six. This points HL to the 6 bytes representing the letter. The program repeats the loop six times to print the coded bits to the printer. When the program is on the 960 dots-per-inch mode, each byte prints twice. After completing the small loop, the program returns to the main loop until the buffer's empty.

The ROM driver in the LPRINT routine blocks control-code characters such as zero, 10, and 12 from reaching the printer. These codes control form feeds and other printer functions. The LPRINT routine doesn't block any other characters, eliminating the cumbersome POKEing found in some programs.

The character the program prints is in the C register. The program preserves all other registers on entry in the LPRINT routine and restores them on exit.

The program stores the data for each character in RAM before the driver program, and arranges it with an ASCII zero at the beginning and an ASCII 255 at the end. Each printed letter requires 6 bytes of information. The total memory required is about 15,000 bytes.

Emphasized-Character Driver

Listings 3 and 4 have a bigger matrix size and an expanded command set than Listings 1 and 2. The driver in Listing 4 operates similarly to that in Listing 2, but requires about 8K of RAM compared to Listing 2's 4K.

Listing 4 also uses flags differently. Instead of using up to six separate memory locations for on/off storage, it uses a single 8-bit byte.

Each bit is either on (a zero) or off (a 1), indicating the driver mode. Bit 7 is the control code bit. Bit zero is the emphasized yes/no bit. Bit 1 controls inverse printing. Bit 2 affects underlining, and bit 3 controls whether the program uses Epson's character set or a new one.

The reason for using the bits of 1 byte rather than several bytes is the new command set. The inverse and underline commands can occur in the middle of a line and need to be checked during printing.

ALTSET saves the current flag state with each character. The program stores status flags in a buffer 100 bytes ahead of the ALETTS buffer (similar to LETTS).

When PRIBUF prints the characters, the flag bits change for each letter. This lets you invert the first letter in a paragraph or word, or alternate the inverse feature. For example, a program could control the turning off and on of printout so that it inverts every other letter not including the space.

The new commands in Listing 3, &I, &J, &L, and &M, represent inverse on, inverse off, underline on, and underline off, respectively. You can mix commands in a line without any problem.

The inverse mode changes everything to reverse printing: A normal white-on-black letter appears as black on white. Use it to make a word or phrase stand out.

Unlike Listing 2, the driver in Listing 4 has two buffers: one for the top and one for the bottom of each line. Since character widths are variable, the program must find the second buffer by multiplying the character width by 256 and adding the result to the start of the first buffer.

The location of the first buffer never changes. The program reserves E000–E009 hex for control information by the driver program, and the first buffer starts at E00A hex.

The editor program in Listing 4 puts the character width byte into E000 hex with the other control bytes. E001 hex holds the line spacing value in increments of 1/72 of an inch. The default value is 8/72 of an inch. E002 hex holds

Listing 2 continued

```
F80C 2803     02790          JR      Z,TWO                   ;Jump if 6 mode
F80E CD29F8   02800          CALL    LPRINT                  ;Print it
              02810 ;
F811 10F1     02820 TWO      DJNZ    LP2                     ;Outer loop
              02830 ;
F813 C3E3F7   02840          JP      LOOP                    ;and till done
              02850 ;=====================================
              02860 ;
F816          02870 DONE     EQU     $
F816 0E0D     02880          LD      C,13                    ;<ENTER>
F818 CD29F8   02890          CALL    LPRINT                  ;DO IT
F81B 110000   02900          LD      DE,0                    ;Zero count
F81E ED533CF8 02910          LD      (COUNT),DE
F822 DDE1     02920          POP     IX                      ;Restore regs
F824 C1       02930          POP     BC
F825 E1       02940          POP     HL
F826 D1       02950          POP     DE
F827 F1       02960          POP     AF
F828 C9       02970          RET
              02980 ;
              02990 ;
F829          03000 LPRINT   EQU     $
F829 F5       03010          PUSH    AF                      ;Save reg A
F82A 3AE837   03020 LP3      LD      A,(14312)               ;Get print stats
F82D E6F0     03030          AND     240                     ;Strip bits
F82F FE30     03040          CP      48                      ;Ready ??
F831 20F7     03050          JR      NZ,LP3
F833 79       03060          LD      A,C                     ;Get print byte
F834 32E837   03070          LD      (14312),A               ;"Print" it
F837 F1       03080          POP     AF
F838 C9       03090          RET
              03100 ;
F839 00       03110 AFLAG    NOP             ;Normal mode
F83A 00       03120 CFLAG    NOP             ;No control
F83B 00       03130 EFLAG    NOP             ;Not emphasized
F83C 00       03140 COUNT    NOP             ;Letter count storage
F83D 00       03150          NOP
F83E 00       03160 LETTS    NOP             ;Printer buffer storage
              03170 ;
              03180 ;
F700          03190          END     ZSTART
00000 TOTAL ERRORS
29785  TEXT AREA BYTES LEFT
```

End

Program Listing 3. Double/EDT, the editor for the double-size character driver.

```
1000 ' Shape Editor for Char Set III -
      by Joseph Gaudreau on August 1, 1983.
      For the Model I TRS-80 with Newdos/80 and an
      Epson Mx-80 with Graftrax +.
      Version 3.2

1010 GOTO1660:' Set up routines
1020 '-=*=-
1030 POKE16383,RND(254):IFPEEK(14463)=0THEN1030ELSEA$=INKEY$
1040 POKE16383,32:IFA$<"1"ORA$>"7"THEN1030
1050 A=VAL(A$):ONAGOTO1120,1140,1430,1550,1460,1290,1080
1060 GOTO1030
1070 '-=*=- Assign new character width -=*=-
1080 PRINT@640,"New character width ???  ";:INPUTWW
1090 IFWW<1ORWW>14THEN1080
1100 POKE-8192,WW:GOTO1670
1110 '-=*=-  LOAD DATA -=*=-
1120 PRINT@576,"LOAD -";:PRINT@640,"Filename - ???  ";:LINEINPUT
F$:CMD"LOAD "+F$:PRINT"File loaded.":GOSUB1620:GOTO1670
1130 '-=*=-  SAVE DATA -=*=-
1140 PRINT@576,"SAVE -";:PRINT@640,"Filename - ???  ";:LINEINPUT
F$
1150 CMD"DUMP "+F$+" 57344"+STR$(57364+512*WW)+" 402DH"
1160 PRINT"File saved.":GOSUB1620:GOTO1030
1170 '-=*=-  EDIT DATA IN WINDOW -=*=-
1180 YD=0:XD=0:W=PEEK(14400):IFW=0THEN1310ELSEIFWAND8THENYD=-1
1190 IFWAND16THENYD=1
1200 IFWAND32THENXD=-2
1210 IFWAND64THENXD=2
1220 IFWAND2THEN1230ELSE1240
1230 FORN=2TOW1:FORO=3TO18:RESET(N,O):NEXT:NEXT:B=0:GOTO1300
1240 IFWAND01THENGOSUB1620:IFB=00THENRESET(XQ,YQ):GOTO1030ELSE10
30
1250 IFYD=0ANDXD=0THEN1300
1260 IFB=0THENRESET(XQ,YQ):RESET(XQ+1,YQ)ELSEB=0
1270 XQ=XQ+XD:YQ=YQ+YD:IFXQ<2THENXQ=2ELSEIFXQ>W1-1THENXQ=W1-1
1280 IFYQ<3THENYQ=3ELSEIFYQ>18THENYQ=18
1290 IFPOINT(XQ,YQ)=-1THENB=1
1300 RESET(XQ,YQ):FORTT=1TO20:NEXT:SET(XQ,YQ):GOTO1180
1310 W=PEEK(14340):IFW=0THEN1300ELSEIFW=4THENB=0:GOTO1260ELSEIFW
=8THENSET(XQ,YQ):SET(XQ+1,YQ):B=1ELSEIFW=16THEN1330ELSE1180
1320 GOTO1180
1330 PRINT@650,"";:LINEINPUT"Save to what character (Letter/ASCI
I) ??? ";L$:IFLEN(L$)=1THENSN=ASC(L$)ELSESN=VAL(L$)
```

Listing 3 continued

Listing 3 continued

```
1340 IFSN<0ORSN>255THEN1330
1350 PRINT@714,"Saving under ASCII number";SN;"-->";:POKE16108,A
BS(SN):IFB=0THENRESET(XQ,YQ)
1360 G=WW*SN-8182:G1=G+WW*256
1370 FORX=2TOW1-1STEP2:E=0:E1=0:FORY=3TO10
1380 IFPOINT(X,Y)=-1THENE=E+V(Y-3)
1390 IFPOINT(X,Y+8)=-1THENE1=E1+V(Y-3)
1400 NEXT
1410 PRINT@510+2*X,E;:PRINT@574+2*X,E1;:POKEG+X/2-1,E:POKEG1+X/2
-1,E1:NEXT:PRINT@768,"";:GOSUB1620:GOTO1180
1420 '-=*=-  CLEAR BUFFER -=*=-
1430 PRINT@522,"Are you really sure ?? (Y/N)";:GOSUB1650:IFA$="Y
"ORA$="y"THEN1440ELSEIFA$<>"N"ORA$<>"n"THEN1430ELSEGOSUB1620:GOT
O1030
1440 PRINT"
Okay then ...";:FORN=-8182TO512*WW-8182:POKEN,0:NEXT:GOSUB1620:G
OTO1670
1450 '-=*=- DISPLAY A SINGLE CHARACTER -=*=-
1460 PRINT@522,"";:LINEINPUT"Load what character ??? ";L$:IFLEN(
L$)=1THENSN=ASC(L$)ELSESN=VAL(L$)
1470 IFSN<0ORSN>255THEN1460
1480 G=WW*SN-8182:G1=G+WW*256:FORX=2TOW1-1STEP2:FORY=0TO7:Z=PEEK
(G+X/2-1):Z1=PEEK(G1+X/2-1)
1490 IFZANDV(Y)THEN1500ELSERESET(X,Y+3):RESET(X+1,Y+3):GOTO1510
1500 SET(X,Y+3):SET(X+1,Y+3)
1510 IFZ1ANDV(Y)THEN1520ELSERESET(X,Y+11):RESET(X+1,Y+11):GOTO15
30
1520 SET(X,Y+11):SET(X+1,Y+11)
1530 NEXT:NEXT:GOSUB1620:GOTO1030
1540 '-=*=-  PRINT CHARACTERS TO PRINTER FOR SAMPLE -=*=-
1550 LPRINT"&Y":RESTORE
1560 READG,H:IFG=0THENLPRINT"&Z":GOTO1030
1570 FORN=GTOH:LPRINTCHR$(N);
1580 IFN=38THENLPRINT"&";
1590 NEXT:LPRINT
1600 GOTO1560
1610 :
1620 PRINT:PRINT"Press <SPACE> to continue."
1630 POKE16383,RND(254):IFPEEK(14463)=0THEN1630ELSEPRINT@448,CHR
$(31);:RETURN
1640 PRINT@522,STRING$(64,32);:PRINT@522,"";:RETURN
1650 IFPEEK(14463)=0THEN1650ELSEA$=INKEY$:RETURN
1660 POKE-8191,8:POKE-8192,10
1670 CMD"T":CLEAR10000:DEFINTA-Z:WW=PEEK(-8192):POKE-8190,INT(48
0/WW)
1680 DIMW,O,N,XQ,YQ,X,Y.YD,XD,Z,Z1,TT,G,G1,B,W1,E,E1,A$,J,WW,L$,
SN,A,HI,T,T1,I.V(8)
1690 XQ=2:YQ=3:W=19:W1=2*WW+1:HI=191
1700 CLS:PRINTTAB(W+4);"E D I T O R  -- I I I  --> Width =";WW:P
RINTTAB(W)"<1> Load a previously created character set.":PRINTTA
B(W)"<2> Save the character set in memory.":PRINTTAB(W)"<3> Clea
r character buffer.":PRINTTAB(W)"<4> Print character set in memo
ry."
1710 PRINTTAB(W)"<5> Display a character (ASCII/by character).";
:PRINTTAB(W)"<6> Edit character displayed in window."
1720 FORN=2TOW1STEP2:SET(N,2):SET(N,19):NEXT:FORN=3TO18STEP2:SET
(1,N):SET(W1+1,N):NEXT:SET(W1+1,19):SET(W1,2):SET(W1+1,2):SET(1,
2):SET(1,19):SET(1,18):SET(W1,19):SET(W1+1,18):SET(0,14):SET(W1+
2,14):FORJ=0TO7:V(J)=2[(7-J):NEXT:GOTO1030
1730 DATA1,15,16,31,32,62,63,93,94,124,125,155,156,186,187,191,0
,192,222,223,238,239,255,0,0
1740 END
```

End

Program Listing 4. Double/DVR, the double-size character driver.

```
01000 ; Alternate Character Set Driver -
01010 ; By Joseph Gaudreau on August 1, 1983 for 48k, Model I.
01020 ;Allows use of different character sets on the Mx
01030 ;series of printers with the Graftrax option.
01040 ;Version 3.5 - For use with Editor III.
01050 ;
01060 ; Commands -
01070 ; Control Code is a "&".
01080 ; && - Print the ampersand (&) character.
01090 ; &E - Use emphasized mode when in alternate set.
01100 ; &F - Use normal type when in AS.
01110 ; &I - Use INVERSE printing mode in AS.
01120 ; &J - Use NORMAL printing mode in AS.
01130 ; &L - Underline on while in AS.
01140 ; &M - Underline off while in AS.
01150 ; &Y - Use alternate set.
01160 ; &Z - Set normal printer mode.
01170 ;
01180 ; (BUFFER   ) = Character width.
01190 ; (BUFFER+1 ) = Line spacing.
01200 ; (BUFFER+2 ) = Max characters/line.
```

Listing 4 continued

the maximum characters-per-line count. You can change it to get shorter lines for printing labels and so on.

Unlike Listings 1 and 2, Listings 3 and 4 use short-line logic-seeking. If a line is blank, the driver executes a line feed.

Also, the print head only goes as far to the right as necessary. When printing a blank line, the program executes two line feeds for each line printed. This is because the top part of a line might be blank, while the bottom half contains an underline character.

Emphasized-Character Driver Routines

To accommodate the two-line driver feature in Listing 4, I split the PRIBUF routine into the subroutines GRPRIN, LINEF, Eight, Four, LPRINT, and INVUND. The program makes a dry run for both the first and second lines before printing them.

The dry run tests for blank lines and accommodates logic-seeking. The program disables the LPRINT routine during the dry run, so I added the NOP instruction to it. Some routines change the NOP to a 201 or a zero to disable or enable the LPRINT routine, respectively. The 201 is a Z80 return instruction, and zero represents an NOP.

The SEEKE flag is important in logic-seeking. As the program prints the bytes, it ORs each one to this flag. If SEEKE remains zero after the program prints the whole line, the line is blank and the program prints nothing. Otherwise, the program prints the line.

LINEF executes a carriage return after each buffer print. Eight and Four change the line spacing to reflect which line the program is printing. By adjusting E001 hex, you can change the line spacing.

The Second flag controls operation of the underline. An underline occurs only when the Second flag and bit 2 of the flag are on. Inverse, however, doesn't depend on printing the top or bottom lines.

GRPRIN prints the buffer that HL points to on entering the routine. It also activates the graphics mode, saves and restores the mode flag, and adjusts a few important pointers.

GRPRIN calls INVUD when the program prints character bits. INVUD checks for underline and inverse flags and turns them on and off. The inverse print routine comes after the underline routine because it supports inverted underline characters. The program wouldn't have this feature if I reversed the routines.

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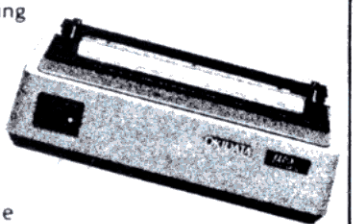

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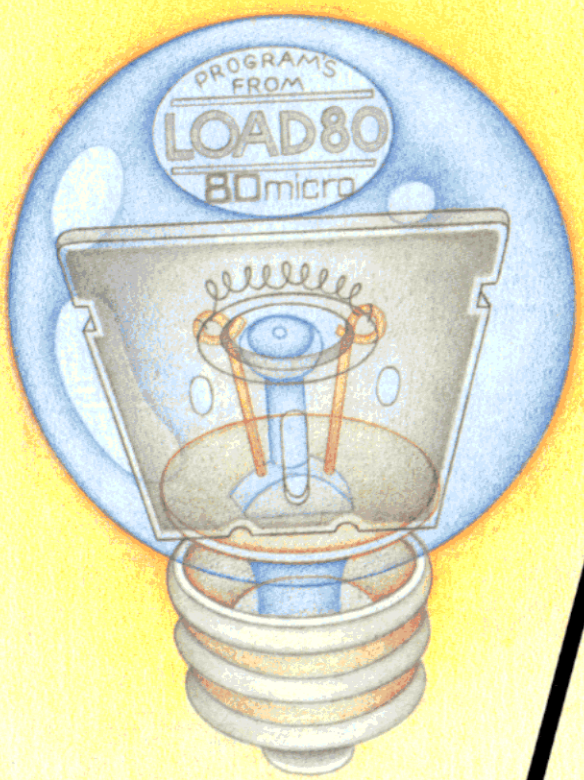

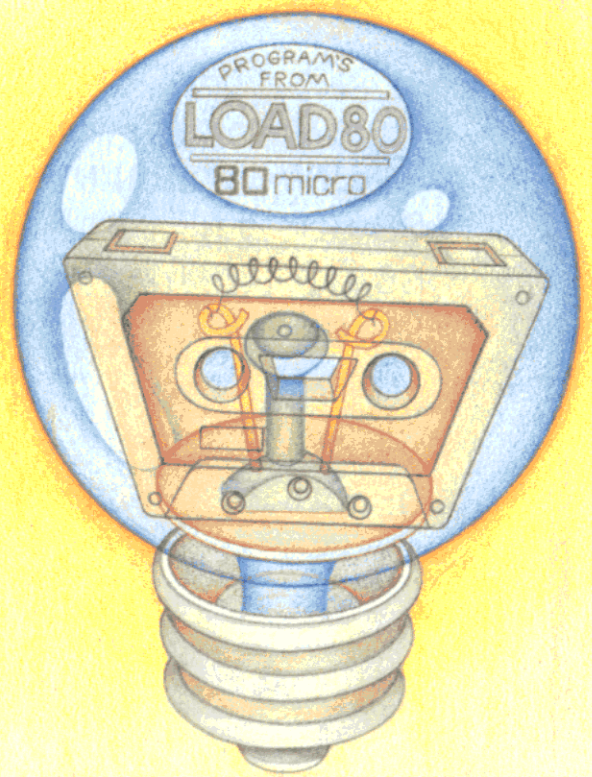

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The computer inverts a byte by XORing the byte with 255. At the bit level, 255 means all on. XOR stands for exclusive OR; one bit or the other, but not both. When both bits are on, the program makes them into a zero and 1 XOR 1 = 0.

Using the Driver

To run the driver programs, type in ALT (or whatever name you chose for it) from DOS Ready. The program boots up, changes some memory locations, and returns to DOS Ready. To load a character set, enter its full name. Tape users should follow the instructions given below.

To use the driver's commands in Basic, LPRINT the codes with the text. For example, LPRINT "Y" enters the alternate mode. LPRINT "&Ethis is fun": LPRINT "&F" prints "THIS IS FUN" in emphasized letters. The second LPRINT command turns the emphasized mode off.

LPRINT "&IT&The &Lcomputer age&M is here" prints "THE COMPUTER AGE IS HERE" with the first letter inverted and the words "computer age" underlined.

Once you're familiar with the new commands and the format, you'll find many uses for the driver. If your word processor uses the printer driver currently installed in memory, you can use the driver to create a special look. If it has a line length feature, set it to one less than the maximum value that the current character set allows. The driver intercepts the codes mixed in with your text at print time. Be sure not to mix &E and &F on the same line or they'll cancel each other out.

Tape Conversions

Tape users should change the driver and editor to work with their systems. Change all references to 402D hex and JP 402D hex to RET. Then load the driver and wait for the program to return to the System prompt.

Load the character set, press the backslash and enter keys to activate the driver, and hit the break key at the next prompt. You have now installed the system. When loading new character sets, hit the break key on the second prompt.

You can save a character set to a tape system in both programs. In Listings 1 and 2, the buffer is from F000–F700 hex. For Listings 3 and 4, the buffer starts at E000 hex and ends at 57364 + 512*(character width) hex. The entry point is 8000 hex.

Use a low-memory monitor that fits

Listing 4 continued

```
                01210 ; (BUFFER+10) = Actual char/code start.
                01220 ;
                01230 ;
E000            01240 BUFFER  EQU     0E000H  ;Alternate character start
                01250 ;
8000            01260         ORG     8000H
8000            01270 ZSTART  EQU     $
8000 211CFC     01280         LD      HL,START                ;Set print driver
8003 222640     01290         LD      (4026H),HL              ;@ print vector
8006 21FEDF     01300         LD      HL,BUFFER-2             ;Set memsize
8009 224940     01310         LD      (4049H),HL
800C 2163FE     01320         LD      HL,FLAG                 ;SET &Y
800F CBDE       01330         SET     3,(HL)
8011 C32D40     01340         JP      402DH
                01350 ;
                01360 ;
                01370 ;
FC1C            01380         ORG     64540
FC1C            01390 START   EQU     $
FC1C 3A63FE     01400         LD      A,(FLAG)                ;Get control flag
FC1F CB7F       01410         BIT     7,A                     ;Test bit
FC21 286C       01420         JR      Z,CMDS                  ;Jump no control
FC23            01430 CONTRL  EQU     $
FC23 CBBF       01440         RES     7,A                     ;Reset control
FC25 3263FE     01450         LD      (FLAG),A                ;Reset flag
FC28 79         01460         LD      A,C                     ;Get code
FC29            01470 EON     EQU     $
FC29 FE45       01480         CP      'E'             ;Turn on EMPHASIZED mode?
FC2B 2007       01490         JR      NZ,FOFF                 ;GO NO
FC2D 3A63FE     01500         LD      A,(FLAG)                ;Get modes
FC30 CBC7       01510         SET     0,A                     ;Set emphasized
FC32 1857       01520         JR      BACK
FC34            01530 FOFF    EQU     $
FC34 FE46       01540         CP      'F'             ;Emphasized mode off ??
FC36 2007       01550         JR      NZ,YON                  ;GO NO
FC38 3A63FE     01560         LD      A,(FLAG)                ;Get modes
FC3B CB87       01570         RES     0,A                     ;Reset modes
FC3D 184C       01580         JR      BACK
FC3F            01590 YON     EQU     $
FC3F FE59       01600         CP      'Y'             ;Use alternate set ??
FC41 2007       01610         JR      NZ,ZOFF                 ;GO NO
FC43 3A63FE     01620         LD      A,(FLAG)
FC46 CBDF       01630         SET     3,A
FC48 1841       01640         JR      BACK
FC4A            01650 ZOFF    EQU     $
FC4A FE5A       01660         CP      'Z'             ;Use normal printer cmds?
FC4C 200D       01670         JR      NZ,ION                  ;GO NO
FC4E AF         01680         XOR     A                       ;A=0
FC4F 3263FE     01690         LD      (FLAG),A                ;Reset flags
FC52 E5         01700         PUSH    HL                      ;Zero count
FC53 210000     01710         LD      HL,0
FC56 2266FE     01720         LD      (COUNT),HL
FC59 E1         01730         POP     HL
FC5A C9         01740         RET
FC5B            01750 ION     EQU     $
FC5B FE49       01760         CP      'I'                     ;Inverse on ??
FC5D 2007       01770         JR      NZ,JOFF                 ;GO NO
FC5F 3A63FE     01780         LD      A,(FLAG)
FC62 CBCF       01790         SET     1,A
FC64 1825       01800         JR      BACK
FC66            01810 JOFF    EQU     $
FC66 FE4A       01820         CP      'J'                     ;Inverse off ??
FC68 2007       01830         JR      NZ,LON                  ;GO NO
FC6A 3A63FE     01840         LD      A,(FLAG)
FC6D CB8F       01850         RES     1,A
FC6F 181A       01860         JR      BACK
FC71            01870 LON     EQU     $
FC71 FE4C       01880         CP      'L'                     ;Underline on ??
FC73 2007       01890         JR      NZ,MOFF                 ;GO NO
FC75 3A63FE     01900         LD      A,(FLAG)
FC78 CBD7       01910         SET     2,A
FC7A 180F       01920         JR      BACK
FC7C            01930 MOFF    EQU     $
FC7C FE4D       01940         CP      'M'                     ;Underline off ??
FC7E 2007       01950         JR      NZ,AMPER                ;GO NO
FC80 3A63FE     01960         LD      A,(FLAG)
FC83 CB97       01970         RES     2,A
FC85 1804       01980         JR      BACK
FC87            01990 AMPER   EQU     $
FC87 0E26       02000         LD      C,'&'                   ;Print a &
FC89 1818       02010         JR      OKAY                    ;Proper mode
FC8B 3263FE     02020 BACK    LD      (FLAG),A                ;Store flag bits
FC8E C9         02030         RET
FC8F            02040 CMDS    EQU     $
FC8F 79         02050         LD      A,C                     ;Get letter
FC90 FE26       02060         CP      '&'                     ;Control char?
FC92 2007       02070         JR      NZ,NOTC                 ;GO NO
FC94 3A63FE     02080         LD      A,(FLAG)
FC97 CBFF       02090         SET     7,A
FC99 18F0       02100         JR      BACK
FC9B            02110 NOTC    EQU     $
FC9B FE0D       02120         CP      13                      ;<ENTER> ??
FC9D 2836       02130         JR      Z,FULL                  ;GO YES
FC9F FE0A       02140         CP      10                      ;<Line-Feed> ??
FCA1 2832       02150         JR      Z,FULL                  ;GO YES
FCA3            02160 OKAY    EQU     $
FCA3 3A63FE     02170         LD      A,(FLAG)                ;Get print mode
FCA6 CB5F       02180         BIT     3,A
FCA8 2003       02190         JR      NZ,ALTSET               ;Jump mode type
FCAA C352FE     02200         JP      LPRINT                  ;Normal let print
FCAD            02210 ALTSET  EQU     $
FCAD E5         02220         PUSH    HL                      ;Save HL/DE
FCAE D5         02230         PUSH    DE
FCAF 216AFE     02240         LD      HL,ZLETTS               ;Point to key buf
FCB2 ED5B66FE   02250         LD      DE,(COUNT)              ;Get byte count
```

Listing 4 continued

Listing 4 continued

```
FCB6 19          02260          ADD     HL,DE   ;Point (HL) to empty let spot
FCB7 71          02270          LD      (HL),C                  ;Store byte
FCB8 13          02280          INC     DE                      ;Next spot
FCB9 ED5366FE    02290          LD      (COUNT),DE              ;Restore count
FCBD D5          02300          PUSH    DE                      ;Save DE fa later
FCBE 116400      02310          LD      DE,100                  ;Flag bytes
FCC1 19          02320          ADD     HL,DE                   ;Point to it
FCC2 D1          02330          POP     DE
FCC3 3A63FE      02340          LD      A,(FLAG)                ;Get flag
FCC6 77          02350          LD      (HL),A                  ;Save it
FCC7 3A02E0      02360          LD      A,(BUFFER+2)    ;Get max char/line
FCCA 32CFFC      02370          LD      (YOW+1),A       ;Set it
FCCD 7B          02380          LD      A,E                     ;Get LSB of count
FCCE FE00        02390 YOW      CP      0                       ;End line yet??
FCD0 2818        02400          JR      Z,PRIBUG                ;GO YES
FCD2 D1          02410          POP     DE                      ;Restore regs
FCD3 E1          02420          POP     HL
FCD4 C9          02430          RET
FCD5             02440 FULL     EQU     $
FCD5 3A63FE      02450          LD      A,(FLAG)                ;Get print mode
FCD8 CB5F        02460          BIT     3,A
FCDA 2003        02470          JR      NZ,FULL2                ;Jump mode type
FCDC C352FE      02480          JP      LPRINT                  ;Normal LF/ENTER
FCDF             02490 FULL2    EQU     $
FCDF ED5B66FE    02500          LD      DE,(COUNT)              ;Test count zero
FCE3 7A          02510          LD      A,D
FCE4 B3          02520          OR      E
FCE5 CA52FE      02530          JP      Z,LPRINT
FCE8 1802        02540          JR      PRIBUF
FCEA             02550 PRIBUG   EQU     $
FCEA D1          02560          POP     DE      ;Restore regs from abort exit up
FCEB E1          02570          POP     HL
FCEC             02580 PRIBUF   EQU     $
FCEC F5          02590          PUSH    AF                      ;Save regs
FCED D5          02600          PUSH    DE
FCEE E5          02610          PUSH    HL
FCEF C5          02620          PUSH    BC
FCF0 DDE5        02630          PUSH    IX
FCF2 3A63FE      02640          LD      A,(FLAG)                ;Get print type
FCF5 CB47        02650          BIT     0,A
FCF7 200C        02660          JR      NZ,NINE60               ;Jump big mode
FCF9             02670 FOUR80   EQU     $
FCF9 3E4B        02680          LD      A,'K'                   ;480 Med-rez mode
FCFB 32B2FD      02690          LD      (WHATM+1),A             ;Set it
FCFE 3E00        02700          LD      A,0                     ;Byte count
FD00 321AFE      02710          LD      (WHATC+1),A             ;Set it
FD03 180A        02720          JR      DOIT                    ;Yea !!!
FD05             02730 NINE60   EQU     $
FD05 3E4C        02740          LD      A,'L'                   ;980 hi-rez mode
FD07 32B2FD      02750          LD      (WHATM+1),A             ;Set it
FD0A 3E01        02760          LD      A,1                     ;Byte count
FD0C 321AFE      02770          LD      (WHATC+1),A             ;Set it
FD0F             02780 DOIT     EQU     $
FD0F 210AE0      02790          LD      HL,BUFFER+10            ;Find 2nd buffer
FD12 3A00E0      02800          LD      A,(BUFFER)              ;Get char width
FD15 110001      02810          LD      DE,256
FD18 B7          02820 LP0      OR      A                       ;A=0 ??
FD19 2804        02830          JR      Z,MULTD1                ;GO YES
FD1B 19          02840          ADD     HL,DE                   ;Repitive add
FD1C 3D          02850          DEC     A                       ;A=A-1
FD1D 18F9        02860          JR      LP0
FD1F 2263FD      02870 MULTD1   LD      (ZIT+1),HL              ;Store address
FD22 226BFD      02880          LD      (ZIT1+1),HL
FD25 ED5B66FE    02890          LD      DE,(COUNT)
FD29 210000      02900          LD      HL,0
FD2C 3A00E0      02910          LD      A,(BUFFER)              ;Get width
                 02920 ; Nifty little routine to multiply DE by WIDTH :
FD2F B7          02930 LP4      OR      A                       ;GO DONE
FD30 2804        02940          JR      Z,MULTD2
FD32 19          02950          ADD     HL,DE                   ;YA
FD33 3D          02960          DEC     A                       ;A=A-1
FD34 18F9        02970          JR      LP4
FD36 3A63FE      02980 MULTD2   LD      A,(FLAG)                ;Get print mode
FD39 CB47        02990          BIT     0,A
FD3B 2801        03000          JR      Z,F80                   ;Jump if 480 mode
FD3D 29          03010          ADD     HL,HL                   ;Double HL
FD3E 7D          03020 F80      LD      A,L                     ;Get LSB
FD3F 32B7FD      03030          LD      (LSB+1),A               ;SET
FD42 7C          03040          LD      A,H                     ;MSB
FD43 32BCFD      03050          LD      (MSB+1),A               ;ALSO TOO
FD46             03060 WOW      EQU     $
FD46 CD8FFD      03070          CALL    EIGHT                   ;Set 8/72" mode
FD49 210AE0      03080          LD      HL,BUFFER+10            ;Point bufl
FD4C CDACFD      03090          CALL    GRPRIN                  ;Short seek
FD4F 2806        03100          JR      Z,HERE                  ;Go on 0
FD51 210AE0      03110          LD      HL,BUFFER+10            ;See above - real
FD54 CDACFD      03120          CALL    GRPRIN
FD57 CD89FD      03130 HERE     CALL    LINEF                   ;Linefeed
                 03140 ;
FD5A 3E01        03150          LD      A,1                     ;Set second line
FD5C 3264FE      03160          LD      (SECOND),A
FD5F CD93FD      03170          CALL    FOUR                    ;Set 12/72" mode
FD62 210000      03180 ZIT      LD      HL,0
FD65 CDACFD      03190          CALL    GRPRIN
FD68 2806        03200          JR      Z,HERE1
FD6A 210000      03210 ZIT1     LD      HL,0
FD6D CDACFD      03220          CALL    GRPRIN
FD70 CD89FD      03230 HERE1    CALL    LINEF
FD73 AF          03240          XOR     A                       ;Reset 2nd line
FD74 3264FE      03250          LD      (SECOND),A
                 03260 ;
FD77 110000      03270          LD      DE,0
FD7A ED5366FE    03280          LD      (COUNT),DE
FD7E ED5368FE    03290          LD      (COUNT1),DE
FD82 DDE1        03300          POP     IX
```

Listing 4 continued

below 8000 hex. T-Bug is inexpensive and does the job if you don't have a monitor.

Model III Conversions

All four programs run on the Model I without conversion, but to run them on the Model III you need to make some minor changes. The memory size vector is 4049 hex on the Model I. For the Model III, change it to 4411 hex. Make the change in the driver's Initialization routine.

Also, the program performs printer input/output at 14312 (37E8 hex) on the Model I, and at port F8 hex on the Model III. Change two lines of the LPRINT routine; LD A,(14312) to IN A,(0F8 hex), and LD (14312),A to OUT (0F8 hex),A.

Printer Conversions

Although I wrote these programs for the Epson MX series printers with Graftrax, conversion to other bit-mapped graphics printers is simple.

The MX-80 has two print densities: 480 and 960 dots per line. Unlike most Radio Shack printers, the Epson uses all 8 bits for firing the print head pins and uses values 0–255. This means you must first specify how many bytes you want to print in graphics mode.

Enter the graphics mode by printing CHR$(27); "K"; CHR$(LSB); CHR$(MSB); for the 480 mode, where LSB and MSB represent the number of graphics bytes to expect. The 960 mode is similar, except that it uses L in place of K.

Bit zero controls the lowest of the eight pins, and bit 7 controls the highest pin. Most Radio Shack printers use values of 128–255 and handle seven pins instead of the MX's eight. You must therefore convert the editor program and driver.

In the editor, change the Scan and Take routines slightly. Also, alter the array holding the bit information variable, V(n). Printers that use eight pins are easier to work with, since the only changes are in printer control codes and how the printer handles its bits.

Since you must create your character set one character at a time, this task requires most of the work in running these programs. Once running, however, these programs are a handy utility for personalizing everything from letters to listings. ■

You can reach Joseph Gaudreau at 314 E. Main St., Malone, NY 12953.

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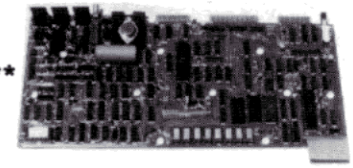

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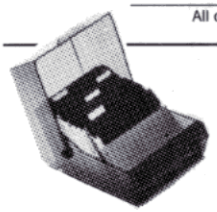

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Listing 4 continued

```
FD84 C1        03310          POP     BC
FD85 E1        03320          POP     HL
FD86 D1        03330          POP     DE
FD87 F1        03340          POP     AF
FD88 C9        03350          RET
               03360 ;
FD89 00        03370 LINEF    NOP
FD8A 0E0D      03380          LD      C,13
FD8C C352FE    03390          JP      LPRINT
               03400 ;
FD8F 3E08      03410 EIGHT    LD      A,8                     ;8/72"
FD91 1803      03420          JR      ROR
FD93 3A01E0    03430 FOUR     LD      A,(BUFFER+1)            ;Get line spac
FD96 C5        03440 ROR      PUSH    BC
FD97 0E1B      03450          LD      C,27                    ;CONTROL
FD99 CD52FE    03460          CALL    LPRINT
FD9C 0E41      03470          LD      C,65                    ;CMD
FD9E CD52FE    03480          CALL    LPRINT
FDA1 4F        03490          LD      C,A                     ;Get spacing
FDA2 CD52FE    03500          CALL    LPRINT
FDA5 C1        03510          POP     BC
FDA6 3EC9      03520          LD      A,201                   ;Disable LPRINT
FDA8 3252FE    03530          LD      (LPRINT),A
FDAB C9        03540          RET
               03550 ;
FDAC           03560 GRPRIN   EQU     $
FDAC 0E1B      03570          LD      C,27            ;Turn on graphics mode
FDAE CD52FE    03580          CALL    LPRINT
FDB1 0E00      03590 WHATM    LD      C,0                     ;Filled in later
FDB3 CD52FE    03600          CALL    LPRINT
FDB6 0E00      03610 LSB      LD      C,0
FDB8 CD52FE    03620          CALL    LPRINT
FDBB 0E00      03630 MSB      LD      C,0
FDBD CD52FE    03640          CALL    LPRINT
FDC0 3A63FE    03650          LD      A,(FLAG)        ;Save current flag byte
FDC3 F5        03660          PUSH    AF
FDC4 AF        03670          XOR     A               ;Reset short seek flag
FDC5 3265FE    03680          LD      (SEEKE),A       ;Do it
FDC8 22E5FD    03690          LD      (WHICH+1),HL            ;Store buff loc
FDCB ED5B66FE  03700          LD      DE,(COUNT)              ;Get count
FDCF ED5368FE  03710          LD      (COUNT1),DE             ;Save to worker
FDD3 DD216AFE  03720          LD      IX,ZLETTS               ;Get letter buff
               03730 ;
FDD7           03740 LOOP1    EQU     $
FDD7 ED5B68FE  03750          LD      DE,(COUNT1)             ;Get letts left
FDDB 7A        03760          LD      A,D                     ;DE=0 ??
FDDC B3        03770          OR      E
FDDD 2849      03780          JR      Z,DONE                  ;GO YES
FDDF 1B        03790          DEC     DE                      ;DE=DE-1
FDE0 ED5368FE  03800          LD      (COUNT1),DE             ;Store count
FDE4 210000    03810 WHICH    LD      HL,0                    ;Point buffer
FDE7 3A00E0    03820          LD      A,(BUFFER)              ;Get width
FDEA 5F        03830          LD      E,A                     ;DE = width
FDEB 1600      03840          LD      D,0
FDED DD7E00    03850          LD      A,(IX)                  ;Get letter
FDF0 DD23      03860          INC     IX                      ;Next location
FDF2           03870 LP1      EQU     $
FDF2 B7        03880          OR      A               ;WIDTH * CHAR = LOCATION
FDF3 2804      03890          JR      Z,MULTD
FDF5 19        03900          ADD     HL,DE
FDF6 3D        03910          DEC     A
FDF7 18F9      03920          JR      LP1
FDF9           03930 MULTD    EQU     $
FDF9 E5        03940          PUSH    HL                      ;Save HL
FDFA DDE5      03950          PUSH    IX                      ;HL=IX
FDFC E1        03960          POP     HL
FDFD 116300    03970          LD      DE,99                   ;Point to flag
FE00 19        03980          ADD     HL,DE
FE01 7E        03990          LD      A,(HL)                  ;Get it
FE02 3263FE    04000          LD      (FLAG),A                ;Set it
FE05 E1        04010          POP     HL
FE06 3A00E0    04020          LD      A,(BUFFER)              ;Get width
FE09 47        04030          LD      B,A                     ;B=A
FE0A           04040 LP2      EQU     $
FE0A 4E        04050          LD      C,(HL)                  ;Get byte
FE0B 23        04060          INC     HL                      ;+ a byte
FE0C 3A65FE    04070          LD      A,(SEEKE)               ;Get test byte
FE0F B1        04080          OR      C                       ;Add Byte
FE10 3265FE    04090          LD      (SEEKE),A               ;E=E+C
FE13 CD35FE    04100          CALL    INVUND
FE16 CD52FE    04110          CALL    LPRINT                  ;Print it
FE19 3E00      04120 WHATC    LD      A,0                     ;Once or twice?
FE1B B7        04130          OR      A                       ;GO 0
FE1C 2806      04140          JR      Z,NOTTWO
FE1E CD35FE    04150          CALL    INVUND
FE21 CD52FE    04160          CALL    LPRINT                  ;Print again
FE24 10E4      04170 NOTTWO   DJNZ    LP2                     ;Loop till done
FE26 18AF      04180          JR      LOOP1
FE28           04190 DONE     EQU     $
FE28 F1        04200          POP     AF              ;Restore current flag
FE29 3263FE    04210          LD      (FLAG),A
FE2C AF        04220          XOR     A                       ;Enable printer
FE2D 3252FE    04230          LD      (LPRINT),A
FE30 3A65FE    04240          LD      A,(SEEKE)       ;Get test byte for eval
FE33 B7        04250          OR      A               ;Set flag bits
FE34 C9        04260          RET
               04270 ;
FE35           04280 INVUND   EQU     $
FE35 F5        04290          PUSH    AF                      ;Save AF regs
FE36 3A64FE    04300          LD      A,(SECOND)              ;Second printing?
FE39 B7        04310          OR      A                       ;If 0 then go
FE3A 2809      04320          JR      Z,INV
FE3C 3A63FE    04330          LD      A,(FLAG)                ;Underline on?
FE3F CB57      04340          BIT     2,A
```

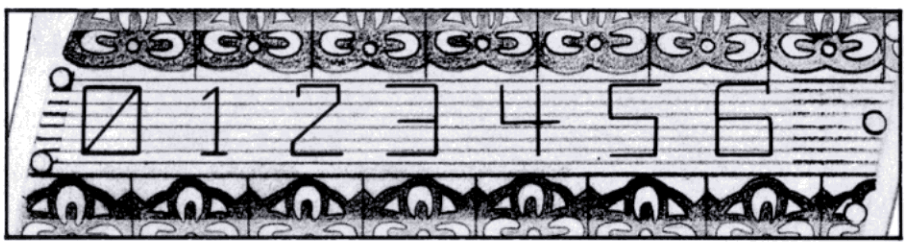
Listing 4 continued

Scanned by Ira Goldklang - www.trs-80.com

Listing 4 continued

```
FE41 2802      04350          JR      Z,INV
FE43 CBC9      04360          SET     1,C                    ;Set underline
FE45 3A63FE    04370 INV      LD      A,(FLAG)               ;Inverse ?
FE48 CB4F      04380          BIT     1,A
FE4A 2804      04390          JR      Z,ZEND                 ;Go no
FE4C 79        04400          LD      A,C                    ;Inverse bits
FE4D EEFF      04410          XOR     255                    ;Flip
FE4F 4F        04420          LD      C,A
FE50 F1        04430 ZEND     POP     AF
FE51 C9        04440          RET
               04450 ;
               04460 ; Remember that F0h = "1 1 1 1, 0 0 0 0"
FE52           04470 LPRINT   EQU     $
FE52 00        04480          NOP                            ;Disable location
FE53 F5        04490          PUSH    AF
FE54 3AE837    04500 LP3      LD      A,(14312)              ;Get print stats
FE57 E6F0      04510          AND     0F0H                   ;Strip low bits
FE59 FE30      04520          CP      48                     ;Ready ??
FE5B 20F7      04530          JR      NZ,LP3
FE5D 79        04540          LD      A,C                    ;Get print byte
FE5E 32E837    04550          LD      (14312),A              ;"Print" it
FE61 F1        04560          POP     AF
FE62 C9        04570          RET
               04580 ;
               04590 ; Flags and general storage of program variables -
FE63 00        04600 FLAG     NOP             ;Flaf bit storage for ALT's modes
FE64 00        04610 SECOND   NOP             ;Second line in progress flag
FE65 00        04620 SEEKE    NOP             ;Short-seek flag - 0=shortest
FE66 00        04630 COUNT    NOP             ;Letter count storage
FE67 00        04640          NOP
FE68 00        04650 COUNT1   NOP             ;Secondary storage
FE69 00        04660          NOP
FE6A 00        04670 ZLETTS   NOP             ;Printer buffer storage
               04680 ;
               04690 ;
8000           04700          END     ZSTART
00000 TOTAL ERRORS
26597  TEXT AREA BYTES LEFT
```

End



Tidbit #15

If you constantly check the values of variables in a program, this technique will save you a lot of time. For example, to be assured that the values of X, Y, and W are within the proper boundaries before a program continues execution, you'd probably use program statements similar to these:

1750 IF X>50 OR X<0 THEN GOTO (subroutine)
1760 IF Y>75 OR Y<−5 THEN GOTO (subroutine)
1770 IF W>16 OR W<1 THEN GOTO (subroutine)

You can easily condense these three lines, however, into one statement by adding the greatest possible value of the three variables, then adding the smallest possible value for each. The result is:

1750 IF X+Y+W>141 OR X+Y+W<−4 THEN GOTO (subroutine)

If this statement is true, shunt the program to a routine that checks each variable's value, making changes if necessary.

The statement below saves you time if your range is dependent on other variables:

1750 IF Y+W+AS>Q+CS+32 OR Y+W+AS<BE+6+E THEN GOTO (subroutine)

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80tk DS, Half-High, TEAC FD55-F	269
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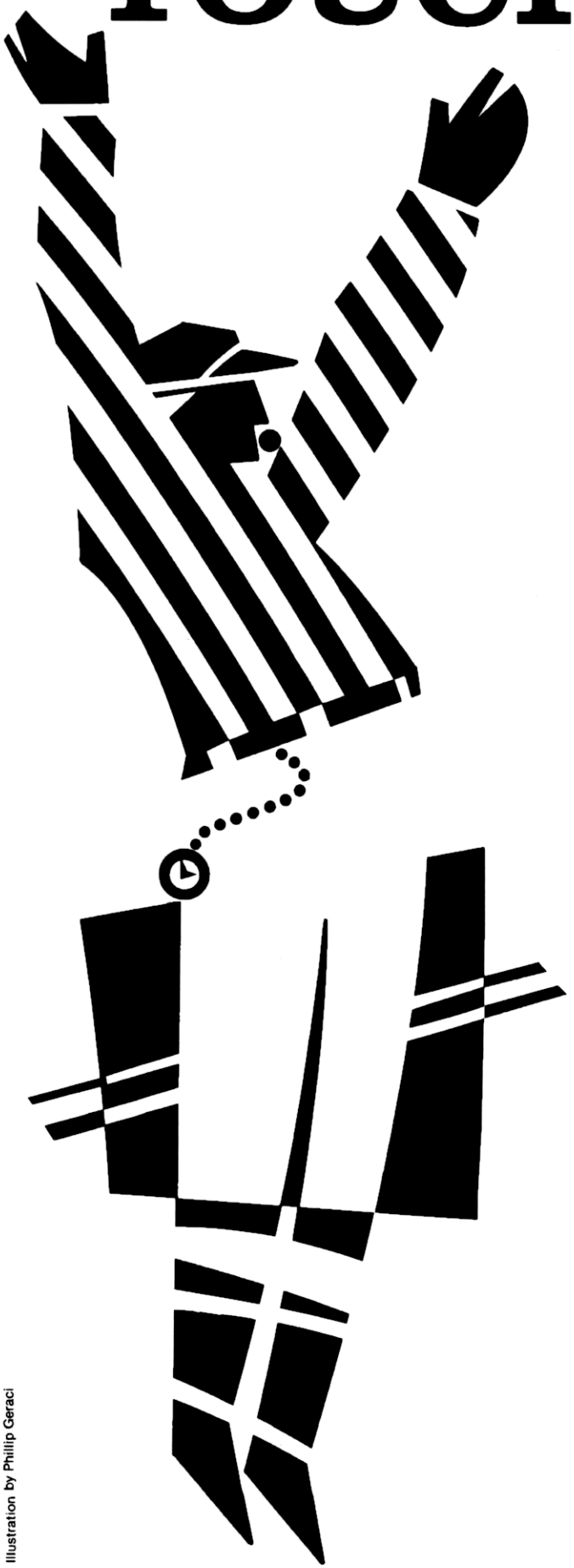

Illustration by Phillip Geraci

Touchdown gives you armchair football at its best—you develop the team strategy that keeps you in the game.

by
Wayne Blair

Get out your stogie and do your best Vince Lombardi pace. It's time for the Big Game.

Touchdown is a Model III Basic football simulation that puts you and an opponent in command of your favorite teams. It requires strategy, quick thinking, and unwavering discipline to select the correct plays before the clock runs out.

You and your opponent take turns calling offensive plays to gain yardage for a touchdown. Success depends on chance and your skill at selecting the right plays.

Field Preparations

To start playing Touchdown, type in and run the Program Listing. Enter names for the home and visiting teams at the prompt (names must be between three and 15 characters).

Touchdown displays a scoreboard at the screen top and a time-out indicator and countdown indicator in the center of the screen. When the countdown ends, Touchdown presents you with a menu of plays.

Program Listing. Touchdown.

```
10 POKE16526,161:POKE16527,2:X=USR(0)
20 CLS:GOSUB290:CLEAR125:U=539:X0=429:RANDOM
30 X3=143:X4=390:X5=170:X6=211:X7=233:X8=275:X9=297:QR=1:Q=580
40 T1=10:T2=0:CX=1:DN=1:YE=3:YU=3:G1=249:G2=313:YG=10:YL=30
50 QR$="1st":C0=15533:C1=16921:C2=16920:C3=16919:GOSUB730
60 C4=15503:C5=15504:C6=15506:C7=15508:C8=15509:C9=15661
70 PRINT"TYPE IN HOME ";:GOSUB4550:INPUTHT$:IFHT$=""THEN4560
80 IFLEN(HT$)>15THENHT$=LEFT$(HT$,15)ELSEIFLEN(HT$)<3THEN4560
90 PRINT"TYPE IN  VIS ";:GOSUB4550:INPUTVT$:IFVT$=""THEN4560
100 IFLEN(VT$)>15THENVT$=LEFT$(VT$,15)ELSEIFLEN(VT$)<3THEN4560
110 CLS:GOSUB230:TM$=LEFT$(HT$,3):TN$=LEFT$(VT$,3):OO$=TN$
120 X1=8+LEN(HT$):X2=33+LEN(VT$):FG=LEN(HT$):FH=LEN(VT$)
130 PRINTTAB(7)HT$;TAB(32)VT$;TAB(53)"*TRS-80*":PRINT
140 PRINTTAB(7)"TIME";TAB(32)"DOWN";TAB(51)"TIME-OUTS:"
150 PRINTTAB(7)"QUARTER";TAB(32)"YDS TO GO";TAB(53)TM$;" ";YU
160 PRINTTAB(7)"ON OFFENSE:";TAB(32)"YD LINE";TAB(53)TN$;" ";YE
170 PRINTSTRING$(63,"-")
180 POKE16916,6:CLS
190 GOTO2520
200 REM"DELAY SUBS"
210 DE=18:GOTO310
220 DE=80:GOTO310
230 DE=270:GOTO310
240 DE=400:GOTO310
250 DE=500:GOTO310
260 DE=550:GOTO310
270 DE=650:GOTO310
280 DE=1000:GOTO310
290 DE=1200:GOTO310
300 DE=1500
310 FORD=1TODE:NEXTD:RETURN
320 REM"RANDOM SUBS"
330 R=RND(45)+10:RETURN
340 R=RND(29)+26:RETURN
350 R=0:GOTO630
360 R=RND(3):GOTO630
370 R=RND(6)+2:GOTO630
380 R=(RND(4)*3)+2:GOTO630
390 R=RND(10)*RND(2):GOTO630
400 R=RND(35)+4:GOTO630
410 R=RND(10)*RND(4):GOTO630
420 R=RND(4)*5:GOTO630
430 R=RND(4)*15:GOTO630
440 R=(RND(5)*2)+RND(2):GOTO630
450 F=RND(6):IFF=1THENR=100ELSER=0
460 GOTO630
470 F=RND(3):R=RND(6)+4:IFF=1THEN630
480 IFF=2THENR=R*-1ELSER=0
490 B=1:GOTO630
500 REM"RANDOM SUBS"
510 F=RND(12):GOTO4770
520 F=RND(8):ONFGOTO350,360,370,360,360,350,360,360
530 F=RND(10):ONFGOTO590,390,370,440,380,360,370,360,610,360
540 F=RND(7):ONFGOTO360,350,360,380,360,440,360
550 F=RND(10):ONFGOTO370,350,370,590,390,370,380,440,610,370
560 F=RND(10):ONFGOTO380,370,590,350,390,360,440,610,370,350
570 F=RND(10):ONFGOTO440,350,360,440,450,420,350,440,370,470
580 F=RND(10):ONFGOTO440,350,370,350,410,350,450,350,390,470
590 F=RND(7):IFF=1THENR=100ELSER=0
600 GOTO630
610 F=RND(4):R=RND(5):IFF=1THENR=R*-1
620 GOTO630
630 REM"STAT COMPUTATION"
640 IFR=100THEN660ELSEIFC=1ANDR>YLTHENR=YL
650 IFC=0ANDR=60ANDYL>39THENR=100-YL
660 IFOO$=TN$THEN700
670 IFB=1THENA1=A1+1:IFR<100THENA2=A2+R
680 IFB=0THENA3=A3+1:IFR<>0ANDR<100THENA4=A4+1:A6=A6+R
690 RETURN
700 IFB=1THENS1=S1+1:IFR<100THENS2=S2+R
710 IFB=0THENS3=S3+1:IFR<>0ANDR<100THENS4=S4+1:S6=S6+R
720 RETURN
730 POKEC1,0:POKEC2,0:POKEC3,0:RETURN
740 POKEC4,49:POKEC5,48:POKEC6,58:POKEC7,48:POKEC8,48:RETURN
750 CM=PEEK(C2):CS=PEEK(C3):RETURN
760 POKEC2,CM:POKEC3,CS:RETURN
770 PH=1:YZ=0:ER=0:ZZ=0:B=0:P5=21:UL=RND(2):IFUL=1THENRANDOM
780 ZZ$=INKEY$:IFOO$=TM$THENPP$=TN$ELSEPP$=TM$
790 RETURN
800 REM"SCOREBOARD VIDEO"
810 IFT1=10THENX3=142
820 PRINT@X1,HS;@X2,VS;
830 PRINT@X3,T1;":";T2;
840 PRINT@X5,DN;@X6,QR$;@X7,USING" ##";YG;
850 PRINT@X8,OO$;@X9,USING" ##";YL;
860 IFDN=1THENPOKEC0,42ELSEPOKEC0,32
```

Listing continued

Game Time

Three clocks operate during the game: the internal clock, a scoreboard clock, and a 20-second clock. The computer's internal clock provides timekeeping and synchronization for the scoreboard clock and 20-second clock. The program disables the TRS-80 clock display and alters computer real time.

Each quarter lasts 10 minutes. The scoreboard clock displays the time remaining in each quarter and runs throughout the game. The clock stops while each play executes, then updates the time following play completion. The clock also stops during time-outs, but starts again as soon as you execute a play.

The 20-second clock gives you the time remaining to select a play. If the 20-second clock reaches zero before you select a play, play stops and you incur a 5-yard delay-of-game penalty.

The 20-second clock resets itself after each play. As with the scoreboard clock, the 20-second clock stops during time-outs.

The Plays

Touchdown automatically handles kickoffs, free kicks after safeties, kick returns, punts, and interceptions. The home team kicks off at the beginning of the game, the visitors kick off in the second half, and kickoffs occur automatically after each score. The program randomly determines the amount of yardage gained on each kickoff.

You can choose from eight offensive plays: four running plays and four passing plays. Plays consist of the most common football strategies, including the quarterback sneak, halfback screen, and split end fly. Each play has an element of risk: Passes can be intercepted, rushers can fumble, and punts can be blocked.

A menu of play options appears on the bottom half of the screen. To run a play, press the corresponding number. You don't need to hit the enter key; the play executes immediately.

Other options include punting (P), attempting a field goal (9), offensive time-out (0), and defensive time-out (T). Touchdown displays the options menu after each play.

The Key Box

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Each play has a range of attainable yardage. Riskier plays can lose yardage, but have a higher maximum attainable yardage. Figure 1 summarizes the plays, and lists the yardage limits and possible adverse consequences for each.

After each touchdown, the program gives you the option of kicking for an extra point (1) or trying for a two-point conversion (2). You must make a decision in five seconds or lose your chance.

Fumbles, interceptions, and blocked kicks occur randomly during the game. Penalties are also random, but are limited to two 5-yard penalties and one 10-yard penalty per game.

Keeping Score

Touchdown's scoreboard remains at the top of the screen throughout the game. In addition to keeping score, it provides information on time remaining, current quarter, team on offense, number of downs, yards-to-go, current field position, and time-outs left (see Fig. 2).

When the offense crosses the 50-yard line or gains possession of the ball inside the 50, Touchdown displays an asterisk to the right of YD LINE. An asterisk also appears next to DOWN on the scoreboard on first down.

The first three letters of the name of the offensive team appear above the options menu when the clock stops, and change to the 20-second clock when the game resumes.

Game Statistics

Touchdown displays cumulative play statistics for the home and visiting teams after each quarter. Figure 3 shows a typical statistics display, and Fig. 4 shows the format for that display.

Statistics include averages for rushes, passes, and punts, number of fumbles and interceptions, and number of penalties and penalty yardage.

Strategy and Wrap-up

Touchdown simulates actual conditions experienced in a football game. Therefore, the best strategy is to make decisions based on your football experience, taking ideas from games you've watched or played.

As the game progresses you'll see that certain plays are more likely to succeed in a given situation. Due to the element of chance, success depends to a certain degree on luck—just like in the pros. ■

Wayne Blair has been writing programs for seven years as a hobby. You can contact him at P.O. Box 811, Dadeville, AL 36853.

Option	Play	Yardage Limits	Contingencies
1	Quarterback sneak	0 to 8	Can't fumble
2	Fullback draw	0 to 14	Can't fumble
3	Halfback sweep	−5 to 20	Can fumble
4	Flanker reverse	−5 to 20	Can fumble
5	Halfback screen	−5 to 20	Can fumble
6	Tight end flare	−10 to 20	Can be intercepted
7	Flanker post	−10 to 40	Can be intercepted
8	Split end fly	−10 to 60	Can be intercepted
9	Field goal	0 to 56	Automatic punt behind 39*-yard line
P	Punt	0 to 55	Can be blocked
T	Time out (offense)		
0	Time out (defense)		

Figure 1. Summary of plays for Touchdown.

```
Home  7                    Visitor  0
Time      10:00            Down        1*     Time-Outs:
Quarter   1st              YDS To Go   10     Hom  3
On Offense: Vis            YD Line     46     Vis  3
```

Figure 2. Typical scoreboard display after first quarter.

```
                          1st Quarter Statistics
            Home                    Visitor
Rush        9   --   50 -  5.6      7   --   28 -  4.0
Pass        6 - 4 - 64 - 16.0       5 - 1 - 5 -  5.0
Turnovers   0     0                 0     1
Penalties   1 - 5                   0 - 0
Punts       1 - 35.0                2 - 42.5
```

Figure 3. A typical statistics display at the end of the first quarter.

Rush	Number of rushes	Yards gained	Average gain
Pass	Number of passes	Number completed	Average gain
Turnovers	Number of lost fumbles	Number of interceptions	
Penalties	Number of penalties	Yards penalized	
Punts	Number of punts	Average gain	

Figure 4. Format of statistics display.

Listing continued

```
870 RETURN
880 IFC=0ANDR=60ANDYL=40THENR=50+(50-YL):RETURN
890 IFC=0THENRETURN
900 IFR>YLTHENR=YL
910 RETURN
920 REM"STATISTICS VIDEO"
930 GOSUB290:CLS:GOSUB230
940 PRINTTAB(23)ST$;" QUARTER STATISTICS"
950 PRINTTAB(18)HT$;TAB(42)VT$:ONERRORGOTO1050
960 E1=A2/A1:E2=A6/A4:E3=S2/S1:E4=S6/S4:U3=U2/U1:U6=U5/U4
970 PRINT"    RUSH";TAB(17)A1;"  --  ";A2;"-";USING" ##.#";E1;
980 PRINTTAB(41)S1;"  --  ";S2;"-";USING" ##.#";E3
990 PRINT@Q,"PASS";TAB(17)A3;"-";A4;"-";A6;"-";USING" ##.#";E2;
1000 PRINTTAB(41)S3;"-";S4;"-";S6;"-";USING" ##.#";E4
1010 PRINT@644,"TURNOVERS";TAB(17)A7;"  ";A5;TAB(41)S7;"  ";S5
1020 PRINT"    PENALTIES";TAB(17)A8;"-";A9;TAB(41)S8;"-";S9
1030 PRINT"    PUNTS";TAB(17)U1;"-";USING" ##.#";U3;
1040 PRINTTAB(41)U4;"-";USING" ##.#";U6:RETURN
1050 REM"/0 ERROR TRAP"
```

Listing continued

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Listing continued

```
1060 RESUMENEXT
1070 PRINT@U,"TOUCHDOWN !!":IFOO$=TM$THENPRINTTAB(T-FG/2)HT$;
1080 IFOO$=TN$THENPRINTTAB(T-FH/2)VT$;
1090 PRINT" !!";:PK=1:GOSUB750:GOSUB290:CLS:RETURN
1100 T=32:R$=") RUN - ":S$=") PASS - ":T$=" SCREEN"
1110 PRINT"1";R$;"QUARTERBACK SNEAK";TAB(T)"5";S$;"HALFBACK";T$
1120 PRINT"2";R$;"FULLBACK DRAW";TAB(T)"6";S$;"TIGHT END FLARE"
1130 PRINT"3";R$;"HALFBACK SWEEP";TAB(T)"7";S$;"FLANKER POST"
1140 PRINT"4";R$;"FLANKER REVERSE";TAB(T)"8";S$;"SPLIT END FLY"
1150 PRINT:PRINT"P) PUNT";TAB(T)"9) FIELD GOAL (Inside 40*)"
1160 PRINT"T) TIME-OUT ";PP$;TAB(T)"0) TIME-OUT ";OO$;:RETURN
1170 GOSUB930:FORIL=1TO63:PRINT"-";:GOSUB210:NEXTIL:RETURN
1180 REM"CONVERSION AFTER TD"
1190 CLS:XP=PEEK(C3):IFXP>53THEN1190
1200 PRINT"CONVERSION ATTEMPT  (5-SECONDS ONLY!)":PRINT
1210 PRINT"SELECT 1) EXTRA POINT KICK"
1220 PRINT"    or 2) TWO POINT TRY"
1230 HH$=INKEY$
1240 IN$=INKEY$:PX=PEEK(C3):IFPX>XP+5THEN1360
1250 IFIN$="2"THEN1270
1260 IFIN$="1"THEN1390ELSE1240
1270 CLS:GOSUB230
1280 PRINT"THE QUARTERBACK ROLLS OUT"
1290 PRINT"ON A RUN/PASS OPTION . . .":GOSUB230:PRINT
1300 CV=RND(3):IFCV=1THENPRINT"HE DIVES FOR THE GOAL . . .";
1310 IFCV=2THENPRINT"HE PITCHES TO THE HALFBACK . . .";
1320 IFCV=3THENPRINT"HE THROWS FOR THE FULLBACK . . .";
1330 GOSUB240
1340 JM=RND(10):IFJM>7THENPRINT"  GOOD !!":GOTO1370
1350 PRINT"  NO GOOD !":GOSUB230:CLS:GOSUB230
1360 DN=1:YL=20:YG=10:C=0:POKEC9,32:KN$=INKEY$:RETURN
1370 IFOO$=TM$THENHS=HS+2ELSEVS=VS+2
1380 GOTO1360
1390 REM"EXTRA POINT"
1400 CLS:GOSUB230:LK=RND(15)
1410 PRINT"THE QUARTERBACK TAKES THE SNAP":GOSUB230
1420 PRINT:PRINT"THE KICK IS UP . . AND . . .";:GOSUB240
1430 IFLK=1THENGOSUB4570:GOTO1360
1440 PRINT"    GOOD !!"
1450 IFOO$=TM$THENHS=HS+1ELSEVS=VS+1
1460 GOTO1360
1470 IFHS>VSTHENDS=HS-VS:L$=HT$ELSEDS=VS-HS:L$=VT$
1480 IFTY=1ANDHS=VSTHENPRINT@599,"THE GAME IS TIED":GOTO1500
1490 IFTY=1THENPRINT@598,L$;" LEADS BY";DS
1500 IFTY=1THENGOSUB270
1510 TY=1:CLS:GOSUB230:RETURN
1520 REM"KICK-OFF"
1530 GOSUB230:CLS:YG=0:DN=0:YL=40:GOSUB800:PRINT@X8,"    ";:CLS
1540 POKEC9,32:GOSUB1470
1550 IFOO$=TM$THENGY$=VT$:GZ$=HT$ELSEGY$=HT$:GZ$=VT$
1560 PRINT" ";GY$;" KICKS-OFF . . .":GOSUB260:PRINT
1570 K1=RND(4):IFK1>2THENYL=RND(21)+9ELSEYL=RND(21)+28
1580 KO=RND(4):IFKO=3THEN1650
1590 PRINTGZ$;" SETS UP THE RETURN":GOSUB230
1600 PRINT"AND HE'S BRINGING IT OUT . . ."
1610 GOSUB270
1620 PRINT"      HE'S DOWN AT THE";YL;:IFYL<30THENPRINT"!!!"
1630 DN=1:YG=10
1640 GOSUB230:GOSUB800:GOSUB270:RETURN
1650 YL=30:YG=10:DN=1
1660 PRINT"IT'S DOWNED IN THE ENDZONE"
1670 GOTO1640
1680 REM"FREE KICK"
1690 YG=10:DN=1:PRINT@X8,"    ";@X5," 1";@X7+1,"10";
1700 GOSUB250:CLS:GOSUB1470:GOSUB230
1710 PRINT"HERE'S THE FREE KICK FROM THE 20 . . ."
1720 GOSUB230:GOSUB220:PRINT
1730 YL=RND(20)+30
1740 PRINT"IT'S RETURNED TO THE";YL;"!!"
1750 GOSUB250:GOTO1780
1760 RETURN
1770 REM"CHANGE OF POSSESSION"
1780 GOSUB270
1790 IFOO$=TM$THENOO$=TN$ELSEOO$=TM$
1800 IFPEEK(C9)=32THENPOKEC9,42:C=1ELSEPOKEC9,32:C=0
1810 DN=1:YG=10
1820 IFC=1ANDYL<10THENYG=YL
1830 GOSUB800
1840 GOTO2760
1850 REM"INTERCEPTION"
1860 GOSUB220:IFC=0THENR=RND(30)+19ELSER=RND(45)+4
1870 PRINT@664,"INTERCEPTED !!":GOSUB220
1880 IFC=0ANDR>YLTHEN1920
1890 IFC=0ANDR<YLTHEN1930
1900 IFC=1ANDR>YLTHEN1930
1910 IFC=1ANDR<YLTHEN1920
1920 PRINTTAB(26)"AT THE";R:GOTO1940
1930 GOSUB230:PRINTTAB(22)"RETURNED TO THE";R
1940 IFOO$=TM$THENA5=A5+1ELSES5=S5+1
```

Listing continued

Listing continued

```
1950 GOSUB230:YL=R:GOTO1780
1960 GOSUB230:CLS:GOSUB220
1970 PRINT@598,"TURNOVER ON DOWNS"
1980 GOSUB250:RETURN
1990 IFOO$=TM$THENOO$=TN$:RETURNELSEOO$=TM$:RETURN
2000 REM"SCOREBOARD UPDATE"
2010 IFC=0THENYL=YL+R
2020 IFC=1THENYL=YL-R:IFYL>50THEN2110ELSEPOKEC9,42
2030 IFYL>50THENYL=50-(YL-50):C=1:POKEC9,42
2040 IFC=0ANDYL<=0THEN2190
2050 IFYL<=0THEN2120
2060 YG=YG-R:IFYG<=0THENYG=10:DN=1:GOTO2080
2070 DN=DN+1:IFDN>4THENGOSUB1960:GOTO1770
2080 IFC=1ANDDN=1ANDYL<10THENYG=YL
2090 IFDN=1THENPOKEC0,42ELSEPOKEC0,32
2100 RETURN
2110 YL=50-(YL-50):C=0:POKEC9,32:GOTO2060
2120 CLS:GOSUB1070
2130 IFOO$=TM$THENHS=HS+6ELSEVS=VS+6
2140 YL=3:DN=0:YG=0:GOSUB800
2150 GOSUB1470
2160 GOSUB1190:GOSUB1990:GOSUB1530:GOSUB800
2170 GOTO2760
2180 REM"SAFETY"
2190 IFOO$=TM$THENVS=VS+2ELSEHS=HS+2
2200 CLS:PRINT@598,"    SAFETY !!!"
2210 PK=1:GOSUB750:GOSUB230
2220 YL=20:GOSUB800:POKEC9,42
2230 GOTO1690
2240 PRINT@590,"THE BALL ROLLS INTO THE ENDZONE !!"
2250 GOSUB250
2260 RX=RND(2):IFRX=1THENGOSUB2290:GOTO2130
2270 GOSUB250:IFOO$=TM$THENOO$=TN$:HS=HS+2ELSEOO$=TM$:VS=VS+2
2280 GOTO2200
2290 GOSUB230:CLS:PRINT@534,"RECOVERED BY ";OO$;
2300 GOSUB230:CLS:GOTO1070
2310 REM"PENALTIES"
2320 CLS
2330 PRINT@598,"DELAY OF GAME!"
2340 PRINTTAB(22)"5-YARD PENALTY"
2350 YP=5
2360 GOSUB230
2370 IFC=0AND(ABS(YP)*2)>YLTHENYP=INT(YL/2):GOSUB4590
2380 IFC=0THENYL=YL-YPELSEYL=YL+YP:GOSUB4600
2390 IFOO$=TM$THENA8=A8+1:A9=A9+YPELSES8=S8+1:S9=S9+YP
2400 YG=YG+YP
2410 GOSUB280
2420 GOSUB800:GOTO2760
2430 M=25:NP=RND(3):PRINT:PRINTTAB(M)"PENALTY !!":GOSUB230
2440 IFNP=1THENYP=5:PRINTTAB(M)"5-YARDS":GOTO4610
2450 IFNP=3THENYP=10:PRINTTAB(M)"10-YARDS":GOTO4620
2460 YP=5:PRINTTAB(M)"5-YARDS":PRINTTAB(21)"OFFSIDES-OFFENSE !"
2470 IFOO$=TN$THEN2500
2480 IFPH=0THENA3=A3-1:A4=A4-1ELSEA1=A1-1
2490 GOTO2360
2500 IFPH=0THENS3=S3-1:S4=S4-1ELSES1=S1-1
2510 GOTO2360
2520 PRINT@535,"** OFFICIAL **":PRINTTAB(26)"TIME-OUT";
2530 PRINT@664,59-PEEK(C3)+1;"SECONDS ";
2540 IFPEEK(C3)<>58THEN2530
2550 IFQR$="1st"ORQR$="3rd"THENGOSUB1530
2560 POKEC2,1:POKEC3,0
2570 GOSUB800:X3=143:GOTO2760
2580 GOSUB770:CLS:PRINT@403,"** SELECT PLAY **";:PRINT
2590 PRINT:GOSUB1100
2600 IN$=INKEY$
2610 VI=VAL(IN$)
2620 P3=P1:P4=PEEK(C3)
2630 P1=PEEK(C2):IFP1>P3THENT1=T1-1
2640 IFT1<0THEN3000
2650 IFP1=0ANDP3>P1THENT1=T1-1
2660 T2=59-P4
2670 PRINT@X3,T1;":";T2;
2680 P5=P5-.3:REM"20-SECOND TIME"
2690 IFINT(P5)=0THEN2320
2700 IFVI>0THEN2750
2710 PRINT@X4,INT(P5);@X0,INT(P5);
2720 IFIN$="P"THEN4130
2730 IFIN$="T"ORIN$="0"THEN2930
2740 VI=VAL(IN$):IFVI<=0THEN2600
2750 ONVIGOTO3340,3460,3540,3620,3780,3890,3990,4060,4430
2760 CLS:IFPK=0THENGOSUB750
2770 PRINT@G1,YU;@G2,YE;
2780 IFCM>10THEN3000
2790 PRINT@X3,10-CM;":";59-CS;
2800 GOSUB770
2810 PRINT@391,OO$;TAB(19)"** SELECT PLAY **";TAB(45)OO$
2820 PRINTTAB(18)"* CLOCK IS STOPPED *":GOSUB1100
2830 IN$=INKEY$
```

Listing continued

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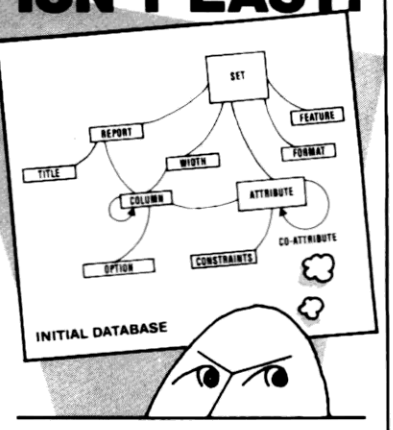

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PRINT @ INPUT/LINE INPUT INPUT #/LINE INPUT #	• • •	• • •	•	•	• • •
READ #/READ # LINE LOC/LOF/EOF/ERROR FIELD/GET/PUT	• •	•	•	•	• • •
RSET/LSET/ERASE MKD$/MKI$/MKS$ CVI/CVS/CVD/SPC	• • •	• • •			• • •
READ/DATA/RESTORE TRON/TROFF DEF FN/RANDOM/RND	• • •	• • •	• •	• •	• • •
DEF USR/SWAP/WAIT CALL (ASSEMBLY LANG) DEFSTR/DBL/SNG/INT	• • •	• •			• • •
DOUBLE/REAL INTEGER/STRING GOTO/GOSUB	•	•	• • •	• • •	• • •
ON ERROR GOTO RESUME/RESUME NEXT ERL/ERR	• • •			• •	• • •
ON number GOTO/GOSUB NAME/RENAME PEEK/POKE/INP/OUT	• • •	• • •	• • •	• • •	• • •
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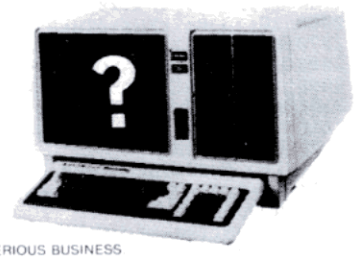

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```
2840 IFIN$="P"THEN2870
2850 IFVAL(IN$)<10ANDVAL(IN$)>0THEN2870
2860 GOTO2830
2870 PK=0:GOSUB760:GOTO2610
2880 CLS:GOSUB250
2890 IFOO$=TM$THENHS=HS+3:OO$=TN$:GOTO2910
2900 IFOO$=TN$THENVS=VS+3:OO$=TM$
2910 GOSUB1530:DN=1:YG=10:C=0:POKEC9,32
2920 GOSUB800:GOTO2760
2930 IFIN$="0"THEN4800
2940 IFIN$="T"THEN4840
2950 REM"TIME-OUTS"
2960 YE=0:GOTO2600
2970 YU=0:GOTO2600
2980 GOSUB2000:GOSUB800:GOSUB250
2990 GOTO2580
3000 ST$=QR$:CM=1:T2=0
3010 IFQR$="4th"THEN3060
3020 IFQR$="3rd"THENQR$="4th":T1=9
3030 IFQR$="2nd"THENQR$="3rd":GOSUB4630:GOSUB800:GOTO3070
3040 IFQR$="1st"THENQR$="2nd":T1=9
3050 GOTO3210
3060 CLS:PRINT@601,"GAME OVER !!!":GOTO3110
3070 IFOO$=TN$THENOO$=TM$
3080 POKEC9,32
3090 C=0:CLS
3100 PRINT@603,"HALFTIME":GOTO3220
3110 QR=4
3120 IFHS>VSTHENPRINTTAB(28-INT(FG/2))HT$;" WINS!!"
3130 IFVS>HSTHENPRINTTAB(28-INT(FH/2))VT$;" WINS!!"
3140 PRINT@832,""
3150 GOSUB740:POKEC4,48:GOTO3230
3160 PRINT@960,"NEXT GAME ?     PRESS <ENTER> or <E>ND";
3170 IN$=INKEY$
3180 IFIN$=CHR$(13)THENRUN
3190 IFIN$="E"THEN4970
3200 GOTO3170
3210 CLS:PRINT@600,"END OF QUARTER"
3220 GOSUB740
3230 GOSUB1170
3240 IFQR=4THEN3160
3250 PRINT@896,"PRESS <ENTER> TO RESUME PLAY";
3260 IN$=INKEY$
3270 IFIN$=CHR$(13)THENGOSUB800:CLS:GOSUB740:GOTO2520ELSE3260
3280 PRINT"    HE'S DROPPED IN THE BACKFIELD !!":GOSUB220
3290 PRINT"    FOR A LOSS OF";:GOSUB230:PRINT-R;
3300 IFR<-1THENPRINT"YDS"ELSEPRINT"YD"
3310 GOSUB230:GOTO3420
3320 GOSUB220:PRINT"    HE'S SACKED !!!":GOSUB220
3330 GOTO3290
3340 CLS:GOSUB230:B=1:GOSUB520:Z=RND(2)
3350 PRINT"THE QUARTERBACK TAKES THE SNAP"
3360 PRINT"AND RUNS BEHIND THE ";:IFZ=1THENPRINT"CENTER . . ."
3370 IFZ=2THENPRINT"GUARD . . ."
3380 GOSUB230:IFB=1ANDR=0THENYZ=RND(7):IFYZ>1THEN3940ELSE3400
3390 IFR=0THEN3420
3400 PRINT"FOR A GAIN OF . .";:GOSUB240:IFYZ=1THEN2430
3410 GOSUB880:PRINTR;"YD";:IFR>1THENPRINT"S"
3420 GOSUB220:GOSUB2000
3430 GOSUB800
3440 GOSUB230
3450 GOTO2580
3460 CLS:GOSUB230:B=1:GOSUB540
3470 PRINT"IT'S THE FULLBACK OFF";
3480 Z=RND(2):IFZ=1THENPRINT" LEFT";
3490 IFZ=2THENPRINT" RIGHT";
3500 Z=RND(2):IFZ=1THENPRINT" GUARD . . ."
3510 IFZ=2THENPRINT" TACKLE . . ."
3520 GOSUB230
3530 GOTO3380
3540 CLS:GOSUB230:B=1:GOSUB530
3550 PRINT"THERE'S A PITCH TO THE HALFBACK . . .":GOSUB230
3560 IFR<0THEN3280
3570 PRINT"HE SWEEPS AROUND";
3580 Z=RND(2):IFZ=1THENPRINT" LEFT END"
3590 IFZ=2THENPRINT" RIGHT END"
3600 IFR=100THENPRINT@604,"FUMBLE !!":GOSUB240:GOTO3690
3610 GOSUB230:GOTO3380
3620 CLS:GOSUB230:B=1:GOSUB550
3630 PRINT"HERE COMES THE FLANKER ON A REVERSE":GOSUB220
3640 IFR<0THEN3280
3650 Z=RND(2):IFZ=1THENPRINT"AROUND THE LEFT SIDE . . ."
3660 IFZ=2THENPRINT"TO THE RIGHT SIDE . . ."
3670 IFR=100THEN3600
3680 GOSUB230:GOTO3380
3690 DN=DN+1:IFDN>4THEN3740
3700 IFER=1THENDN=1
3710 J=RND(3):IFJ>1THEN3740
3720 PRINTTAB(25)"RECOVERED BY ";OO$
```

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Listing continued

```
3730 IFER=0THEN3430ELSEGOSUB800:GOSUB230:GOTO2760
3740 PRINTTAB(22)"RECOVERED BY ";
3750 IFOO$=TM$THENPRINTVT$:A7=A7+1
3760 IFOO$=TN$THENPRINTHT$:S7=S7+1
3770 GOSUB230:GOTO1780
3780 CLS:PH=0:GOSUB230:GOSUB560
3790 PRINT"THE HALFBACK'S GOT THE BALL":GOSUB220
3800 PRINT"ON A SCREEN PASS ";
3810 Z=RND(3):IFZ=1THENPRINT"TO THE LEFT . . ."
3820 IFZ=2THENPRINT"TO THE RIGHT . . ."
3830 IFZ=3THENPRINT"OVER THE MIDDLE . . ."
3840 IFK=0THENHJ=RND(2):IFHJ=1THEN4650ELSEGOSUB4400
3850 GOSUB230:B=1:IFR<0THEN3280
3860 PRINT"HE TURNS UPFIELD"
3870 IFR=100THEN3600
3880 GOSUB230:GOTO3380
3890 CLS:GOSUB230:GOSUB570
3900 PRINT"THE QUARTERBACK DROPS BACK . . .":GOSUB220
3910 IFR<0THEN3320
3920 PRINT"AND THROWS FOR THE TIGHT END":IFR=100THEN1860
3930 GOSUB230:IFR=0THEN4660
3940 IFR=0ANDB=1THENGOSUB4780:GOTO3390
3950 PRINT"HE'S GOT IT IN THE ";
3960 Z=RND(2):IFZ=1THENPRINT"LEFT FLAT"
3970 IFZ=2THENPRINT"RIGHT FLAT"
3980 GOSUB230:GOTO3390
3990 CLS:GOSUB230:GOSUB580
4000 PRINT"THE QUARTERBACK DROPS BACK . . AND . . .":GOSUB220
4010 IFK<0THEN3320
4020 PRINT"SHOOTS A PASS TOWARD THE FLANKER":IFR=100THEN1860
4030 IFR=0THEN3930
4040 GOSUB230:PRINT"HE MAKES THE CATCH":GOSUB230
4050 GOTO3390
4060 CLS:GOSUB230:GOSUB510
4070 PRINT"THE QUARTERBACK ROLLS OUT":GOSUB220
4080 IFR<0THEN3320
4090 PRINT"AND FIRES DOWNFIELD . . .":IFR=100THEN1860
4100 IFR=0THEN3930
4110 GOSUB230:PRINT"THE SPLIT END'S GOT IT"
4120 GOSUB230:GOTO3390
4130 CLS:GOSUB230:GOSUB1990
4140 YG=10:DN=1
4150 PRINT"THE PUNTER TAKES THE SNAP"
4160 GOSUB220:GOSUB340:W=RND(20)
4170 IFW=1THEN4390ELSE4420
4180 GOSUB270:GG=YL:IFC=0THENGG=50+(50-YL)
4190 IFC=0THENYL=YL+R:IFYL<=0THEN2240ELSEIFYL<50THEN4670
4200 IFC=1THENYL=YL-R:C=0
4210 IFYL<=0THENYL=20:C=0:GOTO4370
4220 IFYL>=100THENYL=20:C=0:GOTO4370
4230 IFYL>50THENYL=50-(YL-50):C=0
4240 POKEC9,32:I=RND(4)
4250 GOTO4270
4260 POKEC9,42:I=RND(4)
4270 IFR<35THENI=4ELSEI=RND(4)-1
4280 IFZ=1THENI=2ELSEIFYL<14THENI=0
4290 IFI=1THENGOSUB4750:IFFR=100THEN4760ELSEGOSUB230
4300 IFI=2THENPRINT"IT GOES OUT OF BOUNDS AT THE";YL:GOSUB230
4310 IFI=0THENPRINT"IT'S DOWNED AT THE";YL:GOSUB230
4320 IFI=3THENPRINT"THE BALL ROLLS DEAD AT THE";YL:GOSUB230
4330 IFI=4THEN4680
4340 REM"PUNT LENGTH"
4350 IFR>29THENPRINT"FOR A PUNT OF";R;"YARDS"
```

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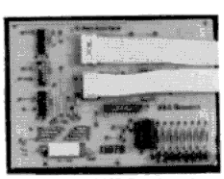

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```
 4360 GOSUB800:GOSUB270:GOTO2760
 4370 PRINT"THE BALL ROLLS INTO THE END2ONE":GOSUB230
 4380 POKEC9,32:GOSUB4940:R=GG:GOTO4350
 4390 PRINT"IT'S BLOCKED !!":ZZ=1:R=R-(RND(28)+28):GOTO4740
 4400 IFOO$=TM$THENA4=A4+1ELSES4=S4+1
 4410 RETURN
 4420 PRINT"HE GETS IT AWAY . . .":GOSUB4880:GOTO4180
 4430 CLS:IFC=0THEN4130
 4440 IFYL>39THEN4130
 4450 GOSUB230:DN=1:YG=10
 4460 PRINT"THE KICKER IS ATTEMPTING"
 4470 PRINT"A";YL+17;"YARD FIELD GOAL"
 4480 GOSUB330:GOSUB230:PRINT"IT'S UP AND . . .";:W=RND(15)
 4490 IFW=1THENGOSUB1990:ZZ=1:GOTO4390
 4500 GOSUB260:IFR>YLTHENPRINT"   GOOD!"ELSE4520
 4510 PK=1:GOSUB750:GOSUB260:GOTO2880
 4520 PRINT"    NO GOOD!"
 4530 GOSUB240:GOSUB1960:IFYL<20THENYL=20
 4540 GOTO1780
 4550 PRINT"TEAM,";STRING$(50," ");"THEN PRESS <ENTER>";:RETURN
 4560 CLS:GOTO70
 4570 PRINT"   BLOCKED !!":GOSUB230:PRINTTAB(31)"NO GOOD !"
 4580 RETURN
 4590 PRINT@658,"HALF-DISTANCE PENALTY ":RETURN
 4600 IFYL>50THENYL=50-(YL-50):C=0:POKEC9,32:RETURNELSERETURN
 4610 PRINTTAB(18)"FOR ILLEGAL PROCEDURE !":GOTO2470
 4620 PRINTTAB(18)"FOR OFFENSIVE HOLDING !";:GOTO2470
 4630 DN=1:YL=40:T1=9:YU=3:YE=3:PRINT@275,"     ";@G1,YU;@G2,YE;
 4640 RETURN
 4650 GOSUB230:PRINT" HE DROPS THE BALL !!":GOSUB210:GOTO3930
 4660 PRINT:PRINT"   IT'S INCOMPLETE":GOSUB230:GOTO2980
 4670 C=1:GOTO4260
 4680 PRINT"THE RETURN'S SET UP . .":GOSUB230
 4690 PRINT"AND HE'S DOWN AT THE";YL:RY=35+RND(10)-R
 4700 FR=RND(15)+85:IFFR=100THEN4760
 4710 GOSUB230
 4720 PRINT"FOR A RETURN OF";RY;"YARDS !!":GOSUB4910
 4730 GOSUB230:GOTO4360
 4740 GOSUB2080:GOSUB220:GOTO4180
 4750 PRINT"IT'S A FAIR CATCH AT THE";YL:FR=RND(15)+85:RETURN
 4760 R=100:ER=1:GOTO3600
 4770 ONFGOTO350,450,350,380,450,350,430,350,450,400,350,470
 4780 PRINT:PRINT"HE'S HIT AT THE LINE . . ."
 4790 GOSUB220:PRINT"FOR NO GAIN ON THE PLAY":RETURN
 4800 IFOO$=TM$THENYU=YU-1:IFYU<0THEN2970
 4810 IFOO$=TN$THENYE=YE-1:IFYE<0THEN2960
 4820 CLS:PK=1:GOSUB750:PRINT@598,"TIME-OUT - ";OO$
 4830 GOSUB240:GOTO2760
 4840 IFOO$=TN$THENYU=YU-1:IFYU<0THEN2970
 4850 IFOO$=TM$THENYE=YE-1:IFYE<0THEN2960
 4860 CLS:PK=1:GOSUB750:PRINT@598,"TIME-OUT - ";PP$
 4870 GOTO4830
 4880 IFOO$=TN$THENU1=U1+1:U2=U2+R
 4890 IFOO$=TM$THENU4=U4+1:U5=U5+R
 4900 RETURN
 4910 IFOO$=TN$THENU2=U2+RY
 4920 IFOO$=TM$THENU5=U5+RY
 4930 RETURN
 4940 IFOO$=TN$THENU2=U2-(R-GG)
 4950 IFOO$=TM$THENU5=U5-(R-GG)
 4960 RETURN
 4970 POKE16916,0:CLS:END
```

End

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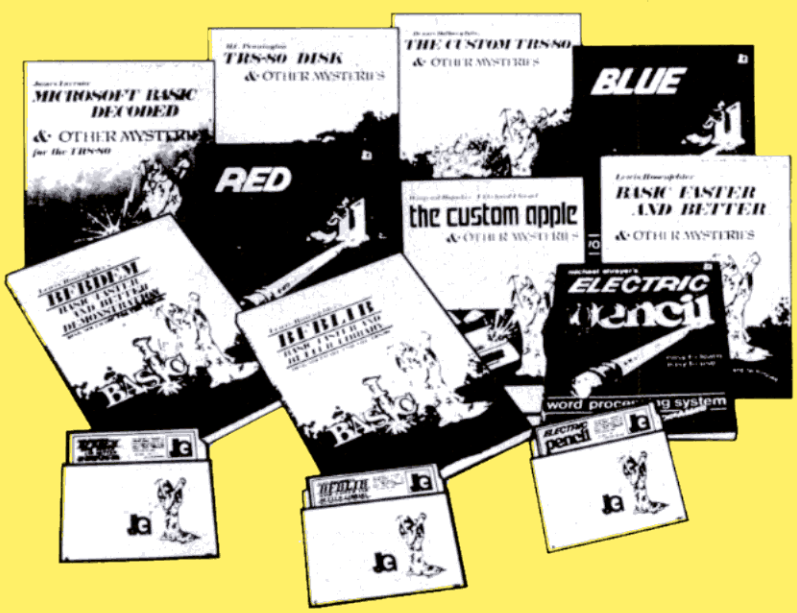

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Fractals:

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Fractals" may sound like a new kind of breakfast cereal, but in fact they're a new category of geometric forms (see Photos 1–7). Fractals occur often in nature, and they have some strange properties. They aren't one-, two-, or three-dimensional, but somewhere in between. Odd as it may sound, they can be finite and infinite at the same time.

Fractals lend themselves to a variety of computer graphics applications, so I've written a Model I/III program that creates regular fractal shapes. But I'll start by explaining how to tell a fractal when you see one.

The Truth About Fractals

The mathematician Benoit Mandelbrot coined the term fractal about a decade ago. The word derives from the Latin for "broken." A fractal is an object or shape having parts that increase toward infinity in number as they decrease toward infinitesimal in size, and the shapes of these parts echo the shape of the whole.

Take, for example, a coastline as seen from a satellite. The large patterns on this scale, covering hundreds of miles, are often remarkably similar to the outline of a section of coast covering only a few hundred yards or even a few hundred inches.

As you reduce the perspective scale, the coastline becomes longer. To a plane flying overhead, a section of coast is one length. But if you're walking, that same stretch of coast is much longer, on account of dips and rises in the land. To an ant crawling over small rocks and into tiny crevasses, the distance is even greater. As the scale gets smaller, the distance approaches infinity.

As another example, start with an equilateral triangle. If you add a smaller triangle to each side, you get a 12-sided star (see Photo 1). Adding still smaller triangles to each side of the star produces a 48-sided figure (see Photo 2). Continue the process and the figure approaches a circle.

The area of the figure is finite; it can't exceed that of a circle tangent to the vertices of the largest triangle. However, the perimeter approaches infinity as you add detail.

Drawing Fractals

The Program Listing is a short Basic program that draws fractals to your specifications. These aren't true fractals; their perimeters aren't infinite. However, you can create figures as detailed as video screen resolution permits. The Table describes the program's most important variables.

When you type in and run the Listing, the program prompts you for the specifications of your figure. First you determine the number of sides of the basic figure. To create the figure shown in Photo 2, for example, you type in 3, because the basic shape is a triangle.

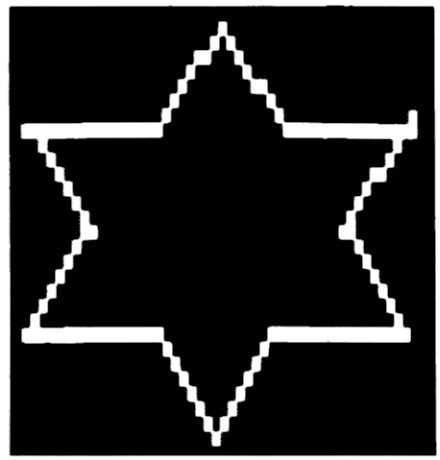

Photo 1. Three sides, no inverse, one level.

The Key Box

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Models I and III
Basic

Then you answer the prompt INVERSE? by typing in Y or N. This determines whether smaller shapes are added (N) or taken away (Y) from the larger shape. Photo 1 shows a three-sided noninverse figure; Photo 3 shows a three-sided inverse figure.

Finally, you control the complexity of the figure by specifying a number of levels. This determines the number of times the program repeats the process of adding or taking away smaller shapes. The higher the number you type in, the more complicated the figure. Inverse figures decrease in area as the number of levels increases; noninverse figures increase in area.

The accompanying photos are screen shots of figures drawn by the program. Photos 1–4 start with a triangle. Photo 1 shows a triangle with a smaller triangle added to each side; you select three sides, no inverse, and one level to create this figure. Photo 2 adds one more level; the program adds smaller triangles to each side of the figure in Photo 1. Photos 3 and 4 show inverse three-sided figures. Photo 3 shows a triangle with smaller triangles taken out of each side; in Photo 4, the process repeats a second time.

In Photo 5, the basic shape is a square; you specify four sides, no inverse, and 3 levels to create this figure. Photo 6 shows a 5-sided, inverse, two-level figure. The figure in Photo 7 is six-sided, noninverse, and has two levels. You can draw a figure with 40 or 50 sides or more, but the number of levels is much more limited.

The program creates regular fractals, rarely found in nature except in some types of perfect crystal growth. However, as I demonstrated in the beginning

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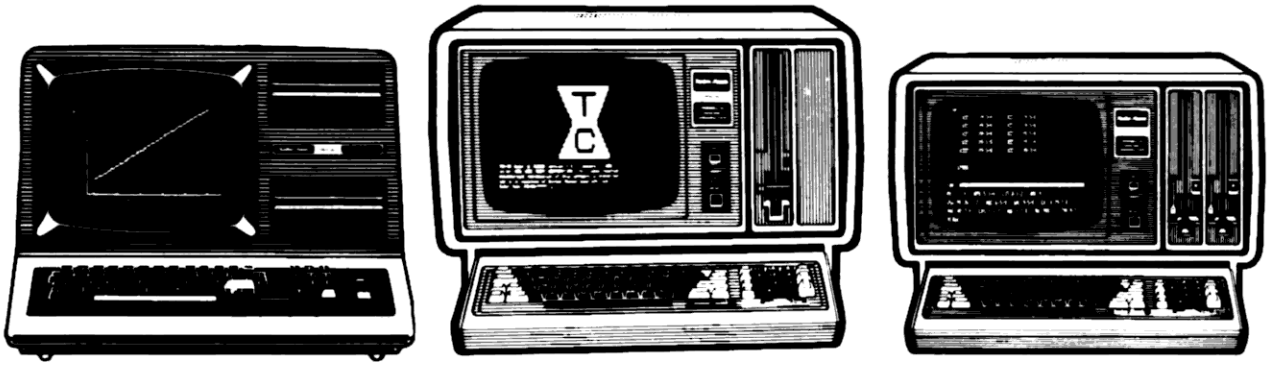

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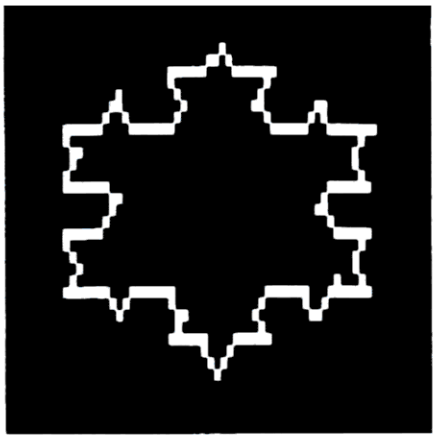

Photo 2. Three sides, no inverse, two levels.

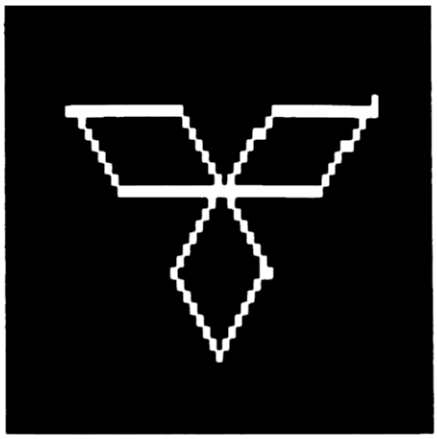

Photo 3. Three sides, inverse, one level.

of this article, landscapes can also be fractals, although they're irregular and asymmetrical.

The idea of landscapes as fractals is behind the work of some computer graphics specialists who create artificial landscapes for flight simulators, movie sets, and other purposes. The fractals you draw with my program are less spectacular, but they're a good place to start exploring the possibilities of these intriguing geometric forms. ■

You can reach Michiel van de Panne, an engineering student at the University of Calgary, at Box 13, Site 16, SS1, Calgary, Alberta T2M 4N3, Canada.

Variable	Description
A$	Contains letters indicating all turns in drawing
A1	Angle of line segment to be drawn next
C$	Contains letter indicating first turn for drawing
CF	Conversion factor between degrees and radians
CX	Starting X value for drawing
CY	Starting Y value for drawing
I$	Contains a 'Y' or 'N' depending on reply to inverse question
L	Number of degrees to turn left in a left turn
LE	Number of levels chosen
LL	Length of all line segments on the screen
R	Number of degrees to turn right in a right turn
S	Number of sides chosen
X1	Starting X value for drawing line
X2	Ending X value for drawing line
Y1	Starting Y value for drawing line
Y2	Ending Y value for drawing line
W	Number of degrees to turn initially, used in inverse drawings

Table. Variables for Fractals program.

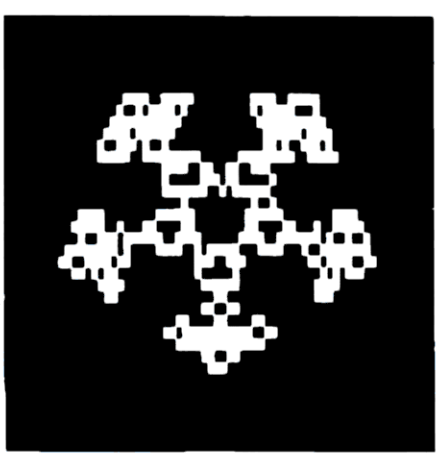

Photo 6. Five sides, inverse, two levels.

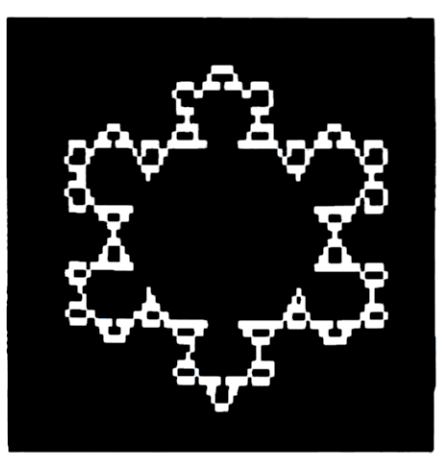

Photo 7. Six sides, no inverse, two levels.

Photo 4. Three sides, inverse, two levels.

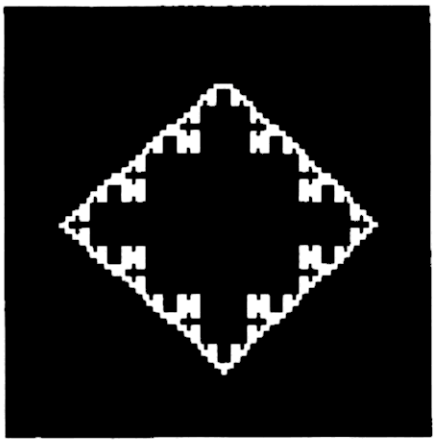

Photo 5. Four sides, no inverse, three levels.

Program Listing. Fractals graphics program.

```
10 REM *** All remarks can be left out ***
20 CLEAR 1000:CLS:CF=3.1416/180
30 REM *** Define point to start drawing ***
40 CX=80:CY=38:X2=CX:Y2=49-CY
50 INPUT"NUMBER OF SIDES";S
60 INPUT"INVERSE";I$:I$=LEFT$(I$,1)
70 REM *** Define number of degrees for right and left turn ***
80 R=-360/S:L=R+180
90 IFI$="Y"THENC$="A":W=R:R=-L:L=-W  ELSE C$="R"
100 A$=C$
110 IFI$<>"Y"THEN140
120 A1$="R":S1=S-2:FORN=1TOS1:A1$=A1$+"L":NEXTN:A1$=A1$+"R"
130 GOTO160
140 A1$="L":S1=S-2:FORN=1TOS1:A1$=A1$+"R":NEXTN
150 A1$=A1$+"L"
160 INPUT"NUMBER OF LEVELS";LE:IF LE=1 THEN GOTO 230
170 REM *** Build string containing right and left ***
180 REM *** turns to be done.                       ***
190 FORN=2 TO LE:LN=LEN(A$)
200 FORN1=1 TO LN:B$=B$+MID$(A$,N1,1)+A1$:NEXTN1
210 A$=B$:B$="":NEXTN
220 REM *** Lines 125-130 choose length of line segments ***
230 CLS:IF S<5 THEN GOTO 250
240 LL=150/(S*3[LE):GOTO270
250 LL=48/(3[LE)
260 REM *** Actual drawing loop begins here ***
270 FORZ=1TOS
280 FORN=1 TO LEN(A$)
290 B1$=MID$(A$,N,1)+A1$
300 FORN1=1 TO LEN(B1$):B$=MID$(B1$,N1,1)
310 IFB$="A"THEN A=A+W:GOTO330
320 IFB$="L"THEN A=A+L ELSE A=A+R
330 A1=A*CF
340 X=X+LL*COS(A1):Y=Y+LL*SIN(A1)
350 XP=INT(X):YP=INT(Y):X1=XP+CX:Y1=49-(YP/2+CY):GOSUB460
360 X2=X1:Y2=Y1
370 NEXTN1:NEXTN:NEXTZ
380 REM *** Done drawing ***
390 PRINT@1019,"DONE";
400 REM *** Press any key to exit ***
410 A$=INKEY$
420 A$=INKEY$:IFA$=""THEN 420  ELSE PRINT:END
430 GOTO420
440 REM *** Check to ensure that endpoints of ***
450 REM *** Line are on screen                 ***
460 IF X1<0 OR X1>127 THEN RETURN
470 IF X2<0 OR X2>127 THEN RETURN
480 IF Y1<0 OR Y1>47 THEN RETURN
490 IF Y2<0 OR Y2>47 THEN RETURN
500 IF X1=X2 AND Y1=Y2 THEN SET(X1,Y1):RETURN
510 REM *** Draw a line from point X1,Y1 to X2,Y2 ***
520 A5=ABS(X2-X1):B5=ABS(Y2-Y1):IFA5>B5THEN530  ELSE570
530 IFX2>X1THENC5=X1:D5=X2:E5=Y1:F5=Y2:GOTO550
540 C5=X2:D5=X1:E5=Y2:F5=Y1
550 G5=D5-C5:H5=(F5-E5)/G5:FORU5=C5TOD5
560 SET(U5,E5):E5=E5+H5:NEXT:GOTO610
570 IFY2>Y1THENC5=Y1:D5=Y2:E5=X1:F5=X2:GOTO590
580 C5=Y2:D5=Y1:E5=X2:F5=X1
590 G5=D5-C5:H5=(F5-E5)/G5
600 FORU5=C5TOD5:SET(E5,U5):E5=E5+H5:NEXT
610 RETURN
```

End

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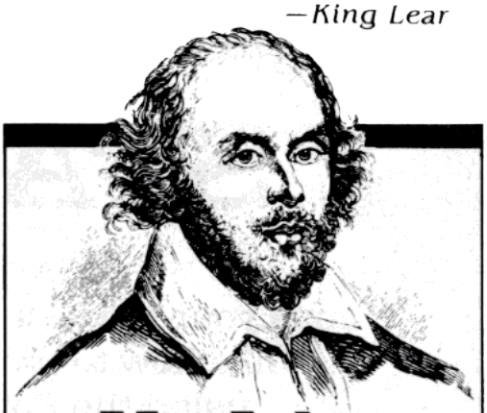
At Christmas I no more desire a rose
Than wish a snow in May's new fangled mirth
But like of each thing that in season grows
—King Lear



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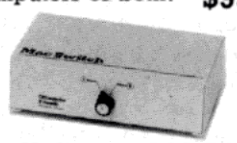

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PRINT STATEMENTS

Things your Model 4 owner's manual never told you about printing—like how to prevent the 4 from aborting a printer operation, using the Forms command to design your documents, and running the 4's built-in spooler.

Your Model 4 owner's manual isn't perfect; in fact, it doesn't tell you everything you need to know about using your system with a printer. If you've upgraded from a Model III to a Model 4, this tutorial will help you take advantage of the new Model 4 printer-interface features. You'll learn how to stop the 4 from aborting the printing operation when it receives a "printer busy" signal, how to use the Forms command to format printer output, and how to use the 4's built-in spooler so you can use the computer while it sends data to the printer.

Busy Signals

One difference between the Models III and 4 is their response to the "printer busy" signal. If the printer isn't ready, the Model III hangs up, while the Model 4 waits 10 seconds and then aborts the operation.

You can modify the Model 4 printer driver so that it hangs up, like the Model III, when a printer error occurs. To do this, you first must find the location of the printer driver. The Device command identifies this as starting at location 0E0F hexadecimal (hex). The value that sets the time delay is at locations 0E28 hex and 0E29 hex. The present value is 07D0 hex. The following patch replaces the delay with code that freezes the computer:

```
PATCH SYS0/SYS.LSIDOS (X'0E2F' = 3E 08
EF FE 80 00 00 00 00 00 00)
```

Because the patch changes the disk and not memory, you have to reboot to make the change effective. This patch keeps the driver hung up until the printer is ready or you press the break key.

If you want to lengthen the 10-second delay period rather than hang up the system, increase the present value. If you clear the printer at any point during this delay, the driver immediately starts working again. Also, pressing the reset button is the only way to interrupt the delay.

Printer Status

When you're writing a Basic program, you can check the printer to see if it's ready before you send data to it. You do this on the Model III by PEEKing 14312 and testing the contents. This method, however, doesn't work for the Model 4. Instead, you can access the printer port with the INP command. The following sequence prints an error message if the printer isn't ready and waits for you to respond:

```
100 IF (INP(248) AND 240) = 48 THEN 200
110 PRINT "PRINTER NOT READY,
<ENTER> TO CONTINUE"
120 I$ = INKEY$ :IF I$ = ""THEN 120 ELSE
100
....
....
200 LPRINT
```

This technique works only before printing starts; it works with both the original driver and the patched version. Unfortunately, a Basic program can't detect a buffer-full condition (printer not ready) in midstream, as it sends more than one character at a time.

Here's another way to test for an error and branch if one occurs. This method doesn't work with the patched version, however:

```
40 ON ERROR GOTO 200
.....
.....
100 LPRINT
.....
.....
200 IF ERR = 57 THEN RESUME 220
210 END              'OR Other RESUME statement
220 Input "Printer not ready, continue (Y or
N)";I$
230 IF I$ = "Y" THEN 100 ELSE .....
```

Assembly-language programmers have more options than Basic programmers, because they can control printer output by building the necessary detection routines. The following sequence reads the printer port to determine printer status:

```
IN      A,(0F8H)
AND     0F0H
CP      30H
JR      Z,OUTPUT
```

The Key Box

Model 4
TRSDOS 6.1
Printer

When the printer is ready, the Z flag is set and your program jumps to the output routine.

Formatting with Forms

The Forms command lets you format your printed documents. This command passes parameters to Forms/FLT, one of the three built-in filter programs, and controls the size of the printed page, number of lines per page, and number of characters per page.

The only problem with Forms/FLT is that it doesn't reset the line counter after printing the first of several files sent to the printer. To remedy this in Basic, type in LPRINT CHR$(06) at the Basic Ready prompt. This command also works from within a Basic program.

From the TRSDOS Ready prompt, pressing the reset button resets the counter, but may also have negative side effects. In keeping track of the number of lines printed in location 100B hex, Forms/FLT resets the location to 00 after you send ASCII 06 to the printer. This memory command is one of several ways to reset to 00:

```
MEMORY (ADD = X'100B',BYTE = X'00')
```

This is cumbersome, but you can use the keystroke multiply filter (KSM), which requires only a single keystroke. Also, you can save the Forms/FLT configuration with the SYSGEN command. Each time you boot up, the filter will be installed with the same parameters.

The TRSDOS Spooler

The Spool command sets up a built-in printer buffer that takes data generated from your program and transfers it to your printer as it becomes free. The advantage of this command is that it makes your computer available for other uses. You can either use memory alone or combine it with the disk buffer. Spool works as described in the manual, but with one exception: SuperScripsit won't load properly if you used the MEM parameter in the Spool command line. If MEM isn't specified, the default is 1900 bytes in the memory portion of the buffer.

The command SPOOL (DISK = 30) solves this problem by creating a 30K byte file on drive zero named PR/SPL. You can specify any size disk buffer as long as there's room on the disk. SYSGEN won't save your Spool configuration, but AUTO lets you install it when you boot up your disk. ■

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by Don DeJarnette

A CHILL WIND BLOWS

Be prepared for the harsh winter wind. Chilly calculates the wind chill factor based on temperature and wind speed.

BRRRR. That's the difference between the temperature and the wind chill factor. While temperature readings are important, the wind chill factor is the most accurate measure of human discomfort in cold weather.

My Model I/III/4 program, Chilly, calculates the wind chill factor for given weather conditions (see the Program Listing). The program incorporates the National Weather Service's Equivalent Temperature Chart and a formula developed by Paul A. Siple and Charles F. Passel, the scientists who advanced the idea of wind chill while working in Antarctica in 1939.

Siple and Passel developed their measure of human discomfort based on both temperature and wind speed. They determined the time required to freeze 250 grams of water under various combinations of wind and temperature and extrapolated their data to predict human heat loss from radiation, conduction, and convection.

The result of their study is the formula $H = (A + B\sqrt{v} + Cv)t$ (see the Figure for a definition of the formula symbols). This equation remains the standard measure of wind chill.

The National Weather Service interprets the information from Siple and Passel's calculation. They realized that the general public wouldn't understand units of kilogram calories/square meter/hour, so they use wind-chill temperature equivalents to describe the wind chill factor. The wind-chill equivalent is based on a 4-mile-per-hour (mph) wind, the wind velocity of a person walking briskly.

Chilly's equivalent temperature chart array (array WC) provides data in 5-degree (Fahrenheit) and 5-mph increments. Chilly calculates wind chill heat loss using Siple and Passel's formula after wind velocity and temperature conversions. If the sun is shining, the program adds 200 kilogram calories/square meter/hour to compensate for heat absorption.

Program Listing. Wind chill calculator.

```
20 CLS
40 PRINT  "STAND BY - ARRAY LOADING"
60 DIM WC(10,19)
80 FOR P = 1 TO 10
100 FOR O = 1 TO 19
120 READ WC(P,O)
140 NEXT O,P
160 DATA 45,40,35,30,25,20,15,10,5,0,-5,-10,-15,-20,-25,-30,-35,-40,-45
180 DATA 43,37,32,27,22,16,11,6,0,-5,-10,-15,-21,-26,-31,-36,-42,-47,-52
200 DATA 34,28,22,16,20,3,-3,-9,-15,-22,-27,-34,-40,-46,-52,-58,-64,-71,-77
220 DATA 29,23,16,9,2,-5,-11,-18,-25,-31,-38,-45,-51,-58,-65,-72,-78,-85,-92
240 DATA 26,19,12,4,-3,-10,-17,-24,-31,-39,-46,-53,-60,-67,-74,-81,-88,-95,-103
260 DATA 23,16,8,1,-7,-15,-22,-29,-36,-44,-51,-59,-66,-74,-81,-88,-96,-103,-110
280 DATA 21,13,6,-2,-10,-18,-25,-33,-41,-49,-56,-64,-71,-79,-86,-93,-101,-109,-1
16
300 DATA 20,12,4,-4,-12,-20,-27,-35,-43,-52,-58,-67,-74,-82,-89,-97,-105,-113,-1
20
320 DATA 19,11,3,-5,-13,-21,-29,-37,-45,-53,-60,-69,-76,-84,-92,-100,-107,-115,-
123
340 DATA 18,10,2,-6,-14,-22,-30,-38,-46,-54,-62,-70,-78,-85,-93,-102,-109,-117,-
125
360 CLS
380 PRINT  "IS THIS CALCULATION TAKING PLACE ON A CLEAR DAY WITH THE SUN SHINING
 ? (Y/N) ";
400 INPUT AN$
420 IF AN$="Y" THEN GOTO 440:IF AN$="N" THEN GOTO 440: IF AN$="" THEN GOTO 360
440 CLS
460 PRINT "ENTER TEMPERATURE IN FARENHEIT FROM CHART"
480 PRINT "============================================================"
500 PRINT "45 40 35 30 25 20 15 10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45"
520 PRINT "============================================================"
540 INPUT T: C=T
560 IF C=45 THEN C=1: IF T=45 THEN GOTO 960
580 IF C=40 THEN C=2: IF T=40 THEN GOTO 960
600 IF C=35 THEN C=3: IF T=35 THEN GOTO 960
620 IF C=30 THEN C=4: IF T=30 THEN GOTO 960
640 IF C=25 THEN C=5: IF T=25 THEN GOTO 960
660 IF C=20 THEN C=6: IF T=20 THEN GOTO 960
```

Listing continued

Using Chilly

Once you boot up the program, Chilly asks you if the sun is shining. It then

The Key Box

LOAD 80

Models I, III, and 4
16K RAM Cassette Basic
32K RAM Disk Basic

prompts you for the temperature (in degrees Fahrenheit) and the wind velocity (in miles per hour). After it makes its calculations, Chilly displays the current temperature and wind velocity and the equivalent wind-chill temperature. It also tells you the convective heat lost due to wind chill in kilogram calories/square meter/hour.

Wind chill conditions should be taken seriously, and this program will help you determine when you should take precautions against severe weather conditions. ■

Write to Don DeJarnette at 1913 6th Ave. E., Tuscaloosa, AL 35401.

H = wind chill heat loss in kilogram calories per square meter per hour
v = velocity of wind in meters per second
t = difference in degrees Celsius between skin temperature (33 degrees) and air temperature
A = 10.45
B = 10.0
C = −1.0

Figure. Definition of formula.

Listing continued

```
680 IF C=15 THEN C=7: IF T=15 THEN GOTO 960
700 IF C=10 THEN C=8: IF T=10 THEN GOTO 960
720 IF C=5  THEN C=9: IF T=5 THEN GOTO 960
740 IF C=0 THEN C=10: IF T=0 THEN GOTO 960
760 IF C=-5 THEN C=11: IF T=-5 THEN GOTO 960
780 IF C=-10 THEN C=12: IF T=-10 THEN GOTO 960
800 IF C=-15 THEN C=13: IF T=-15 THEN GOTO 960
820 IF C=-20 THEN C=14: IF T=-20 THEN GOTO 960
840 IF C=-25 THEN C=15: IF T=-25 THEN GOTO 960
860 IF C=-30 THEN C=16: IF T=-30 THEN GOTO 960
880 IF C=-35 THEN C=17: IF T=-35 THEN GOTO 960
900 IF C=-40 THEN C=18: IF T=-40 THEN GOTO 960
920 IF C=-45 THEN C=19: IF T=-45 THEN GOTO 960
940 GOTO 360
960 CLS
980 PRINT  "ENTER WIND VELOCITY IN M.P.H. FROM CHART"
1000 PRINT  "======================================"
1020 PRINT  "4  5  10  15  20  25  30  35  40  45"
1040 PRINT  "======================================"
1060 PRINT: INPUT V: R=V
1080 IF R=4 THEN R=1: IF V=4 THEN GOTO 1300
1100 IF R=5 THEN R=2: IF V=5 THEN GOTO 1300
1120 IF R=10 THEN R=3: IF V=10 THEN GOTO 1300
1140 IF R=15 THEN R=4: IF V=15 THEN GOTO 1300
1160 IF R=20 THEN R=5: IF V=20 THEN GOTO 1300
1180 IF R=25 THEN R=6: IF V=25 THEN GOTO 1300
1200 IF R=30 THEN R=7: IF V=30 THEN GOTO 1300
1220 IF R=35 THEN R=8: IF V=35 THEN GOTO 1300
1240 IF R=40 THEN R=9: IF V=40 THEN GOTO 1300
1260 IF R=45 THEN R=10: IF V=45 THEN GOTO 1300
1280 GOTO 960
1300 CLS
1320 PRINT "TEMPERATURE ";T;"DEGREES FARENHEIT"
1340 PRINT "================================="
1360 PRINT "WIND VELOCITY ";V;"M.P.H."
1380 PRINT "================================="
1400 PRINT "WIND CHILL EQUIVALENT TEMPERATURE ";WC(R,C);"DEGREES FARENHEIT"
1420 PRINT"======================================================"
1440 TP=T: TP=(TP-32)*.55555555#: TP=33-(TP):VL=V:VL=VL*26.82:VL=VL/60
1460 A=10.45: B=10: C=-1
1480 H=(A+(B*(SQR(VL)))+(C*VL))*TP
1500 IF AN$="Y" THEN H=H-200
1520 PRINT "WIND CHILL CONVECTIVE HEAT LOSS IS :"
1540 PRINT H;"KILOGRAM CALORIES PER SQUARE METER PER HOUR"
1560 PRINT "======================================================"
1580 PRINT:PRINT:PRINT
1600 PRINT "HIT ENTER TO RECALCULATE": INPUT Z: GOTO 360
```

End

General-Purpose I/O Board: Make the Connection

There are times when I've wanted to connect a simple LED (light-emitting diode) display to my TRS-80, or to interface a TTL (transistor-to-transistor logic) device to it. Some readers have also asked for a general-purpose input/output (I/O) board that interfaces with CMOS devices. I decided to kill two birds with one stone in this month's column by building a board you can use for either application.

The board's main component is an 8255A parallel peripheral interface (PPI), with an 8253/8254 programmable interval timer (PIT) also included (see the Photo). You can use the MOS versions of these components (available from Intel and other manufacturers) or you can use the new CMOS versions available from Harris and OKI Semiconductor (see the addresses at the end of this column).

In addition to a connecting cable for your TRS-80, you'll need one for I/O. The 50-pin socket connector I use has 16 general-purpose I/O lines, as well as counter inputs and outputs. It also provides a seven-segment display to display the digits from zero through nine. I'll describe the features and operation of the entire board in more detail later.

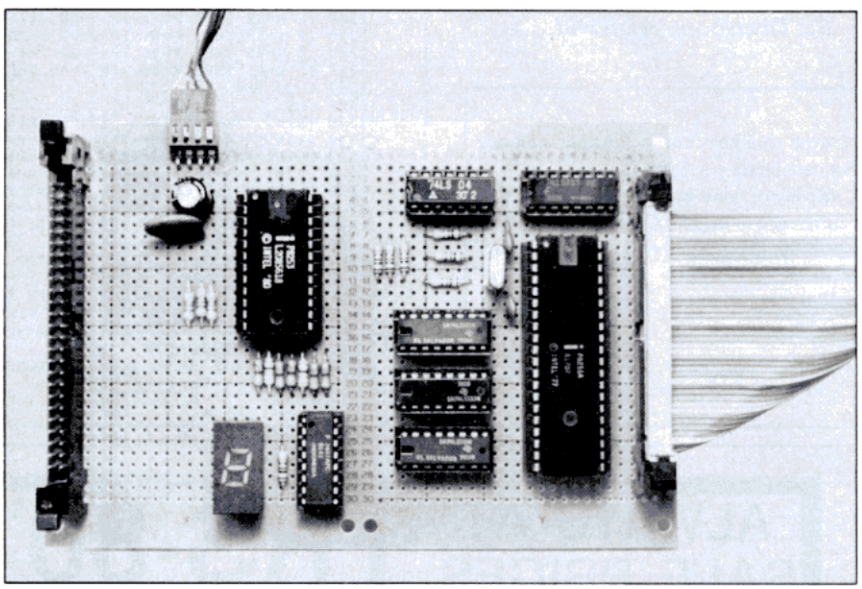

Photo. Completed input/output board.

CMOS versus TTL

CMOS is the up-and-coming logic family because it offers low power and fast speeds. The new high-speed CMOS logic family—the 74HC00 series—offers performance matching that of low-power Schottky (74LS00 series), with a fraction of the power consumption. Other CMOS advantages include excellent noise immunity, high immunity to alpha particle attack, wider possible supply voltages, reduced system cooling requirements, reduced IC packaging requirements, and lower busing and regulating requirements.

While CMOS chips have many uses, you can't easily connect them with TTL devices. CMOS outputs tend to stay close to the power supply "rails" (ground and +5V in most systems). The guaranteed minimum high-level output voltage for a typical CMOS IC is generally within 1 percent of the supply voltage, here at least 4.95V using a +5V supply. Likewise, the guaranteed maximum low-level output voltage is 0.05V when using a +5V supply.

The outputs of TTL devices do not stay so close to the power rails. The minimum high-level output voltage for a TTL device is generally specified at 2.4V, while the maximum low-level output voltage is 0.4V.

The input voltage requirements for CMOS devices are generally within 20 percent of the supply voltage for each rail. Using a +5V power supply, the minimum high-level input voltage is 4V, while the maximum low-level input voltage is 1V. Comparatively, the minimum high-level input voltage requirement for TTL devices is 2V, while the maximum low-level input voltage is 0.8V.

You can see by looking at the specs that CMOS outputs can drive TTL inputs, since the guaranteed output voltage falls within the requirements of the TTL inputs. Also, TTL low-level outputs can drive CMOS inputs, since the TTL output (0.4V maximum) is lower than the CMOS input requirement of 0.8V. A problem arises, however, when you try to drive a CMOS input with a high-level TTL output. The minimum guaranteed high-level TTL output voltage of 2.4V doesn't meet

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the minimum 4.0V input requirement of the CMOS device.

You can overcome this in several ways. A simple pull-up resistor on the TTL output will raise the voltage enough to accommodate the CMOS device. Or, a number of converter chips are available that convert TTL to CMOS levels (and back when you use other than +5V on the CMOS device). A third alternative is to use CMOS devices that accept TTL-level inputs. The new 74HCT00 family does this, as well as the CMOS chips I will consider shortly (the 82C53, 82C54, and 82C55A). The TTL interface on these chips is identical to that of the TRS-80 MOS-equivalent devices, the 8255A and the 8254 (or 8253).

The TTL-level interface isn't without a trade-off, however. The reduced input requirements also reduce the devices' noise immunity.

A Look at the 8255A (82C55A) PPI

The 8255A parallel peripheral interface requires four locations in I/O addressing space: one for the control register and one for each of three I/O ports (ports A, B, and C). The control register is write-only, while the other three registers are read/write. The read/write registers have slightly different functions depending on the 8255A's operating mode.

The 8255A has two primary ports, A and B. They're 8-bit ports, and the 8 bits of either port are all inputs or all outputs; you can't assign the input/output configuration on a bit-by-bit basis as with some other I/O chips.

A third 8-bit port, port C, is actually two half-size (4-bit) ports. When you're in the Basic I/O mode (described below), you can set the directions of the upper and lower halves of port C independently. When you're in any other mode, most of the bits take on special handshaking functions, leaving only a couple of bits left for I/O purposes. The general structure of the 8255A is shown in Fig. 1.

The 8255A has three operating modes: Basic I/O (mode zero), strobed I/O (mode 1), and bidirectional bus (mode 2). Each is useful for different types of applications.

Mode zero is probably the 8255A's most commonly used mode. It provides 24 I/O lines as basic input or output lines, and it's useful to turn devices on or off, configure them, or read their status.

When either port A or port B (or both) is programmed as an output, the port internally latches the binary value written to it and it goes to that port's eight output lines.

Port C is slightly different in that you can individually program each half (4 bits) as input or output. If you write to Port C, it internally latches all of the bits (if any) pertaining to output lines, and the values go to the respective output lines. You can also read back bits written to ports configured as outputs.

Port C has another feature unavailable with port A or B: By sending a special command byte to the 8255A command register, you can set or clear any of the output bits individually (without affecting any of the other bits).

When you configure any of the above ports (or half-ports) as inputs, the computer gets the current bit values simply by reading the respective port. The bits aren't latched in the 8255A, so the computer reads only the current state of the bits.

Mode 1 (strobed input/output) uses several port C lines for handshaking and interrupt functions, leaving only two lines free for general-purpose I/O. I used this mode in my printer buffer project (September and October, p. 102 and p. 146), and it's useful for transferring information between two devices.

Data input to the 8255A is latched internally using the handshaking lines and can optionally cause an interrupt to the processor to occur. Likewise, output data to another device is latched, with the appropriate handshaking taking place. The 8255A can optionally interrupt the processor when the remote device accepts the output value.

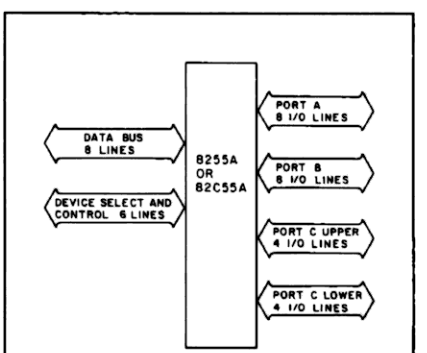

Figure 1. General structure of the 8255A/PPI.

The 8255A lets you select the modes for ports A and B separately. If port A is in mode 1, for example, you could put port B in mode zero, but you'd lose the respective port C handshaking signals.

Which port C lines are available for basic I/O depends on the direction you choose for port A. If port A is an output, PC4 and PC5 will be free. If port A is an input, PC6 and PC7 will be free. In either case, you can assign the free port C pins as both inputs or both outputs. (The printer buffer project has a timing diagram showing the mode 1 timing.)

Mode 2 (bidirectional bus) is permitted for port A only, and also uses several port C bits for handshaking (PC3–PC7). You use this mode to communicate with another device over a common 8-bit bus. Using the handshaking lines, two devices can send information back and forth, with the bus direction changing as needed. Like mode 1, interrupt lines are available, which you can use to notify the processor of certain communication conditions.

When port A is in mode 2, you can specify port B as mode zero or mode 1. When specified as mode zero, you can use port C bits 0–2 as basic I/O lines (all inputs or all outputs). When specified as mode 1, you can use PC0–PC2 as handshaking lines for port B.

Configuring the 8255A

Figure 2 shows the mode control-word format. You must set the high-order bit (bit 7) to indicate a mode set-up; otherwise, a port C bit set/reset function takes place.

Bits 5 and 6 select the mode—zero, 1, or 2—for port A. Bit 4 determines the direction of port A (1 = input, 0 = output). Bit 3 determines the direction for the upper half of port C (or the free port C bits when in mode 1). Bit 2 selects the mode—zero or 1—for port B. Bit 1 selects the direction of port B, and bit zero selects the direction of the lower half of port C (or the lower 3 bits when in mode 2). For more information on the operation of the 8255A, see the manufacturer's data book (see the reference list at the end of this column).

The 8253/8254 (82C53/82C54) PIT

The 8254 programmable interval timer is essentially an improved 8253, providing higher clock speeds and status register read-back. You may notice in the photograph that I used the 8253 instead of the improved 8254. That's because I had several 8253s on hand and didn't need the 8254's extra features.

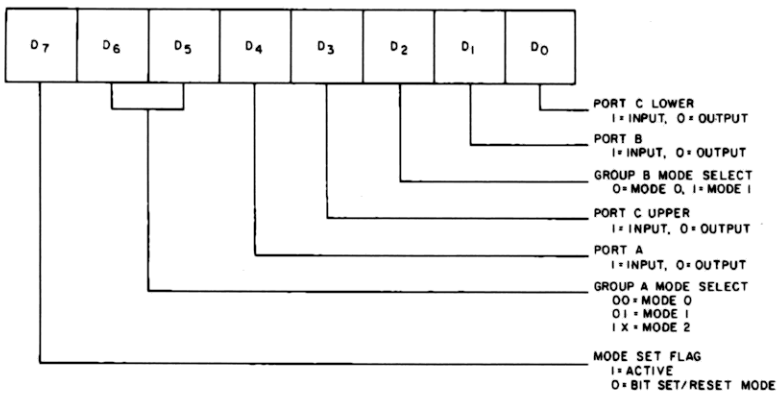

Figure 2. 8255A control word format.

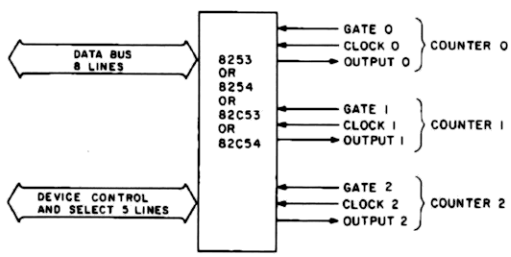

Figure 3. Basic structure of 8253/8254.

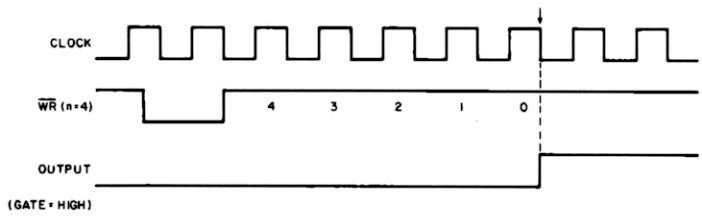

Figure 4. 8254 mode zero timing example.

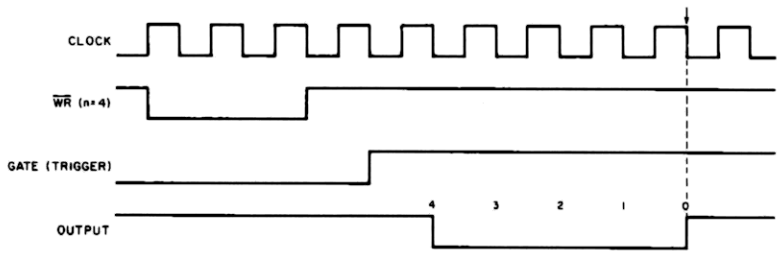

Figure 5. 8254 mode 1 timing example.

Like the 8255A, the 8254 requires four locations in the Z80's I/O addressing space: one for the control register and one for each of the three 16-bit counters on the chip. Unlike the 8253, the 8254 has a control register to and from which you can both write and read.

The 8253's control register is write-only. The 8254's read-back feature gives the processor status information about the chip that would otherwise be unavailable or, at least, would require additional external hardware. The three counter registers are read/write registers, although they should latch time values before reading (as described below).

As mentioned, the 8254 has three 16-bit counter/timers. These are countdown counters: They count down from an initial value and perform a particular operation when they reach zero. Their operation varies depending on the mode you're in. Each counter has an associated clock input, gate input (for on/off control), and output.

The basic structure of the 8254 is shown in Fig. 3. It has six possible operation modes, and you can set each counter individually to operate in any of them. The modes are interrupt on terminal count (mode zero), hardware retriggerable one-shot (mode 1), rate generator (mode 2), square wave (mode 3), software-triggered strobe (mode 4), and hardware-triggered strobe (mode 5).

In mode zero (interrupt on terminal count), the counter goes low when you initially write the count value to it. The chip then decrements the count value for each pulse of the clock input to the counter, as long as the gate signal is high. Counting doesn't take place when the gate is low. When the count value reaches zero, the output goes high. You could use the high output to interrupt the processor or to trigger an external event. A timing diagram for mode zero is shown in Fig. 4.

In mode 1 (hardware retriggerable one-shot), the output initially goes high when you set the mode. When the chip receives a trigger pulse on the gate input, the count value is put into the counter and the output goes low on the next clock pulse. The output then remains low until the counter reaches zero. At that time, the output returns high and the counter waits for another trigger pulse, which makes it restart

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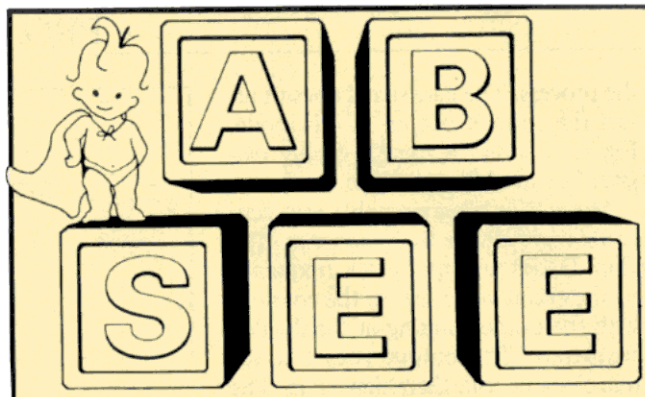

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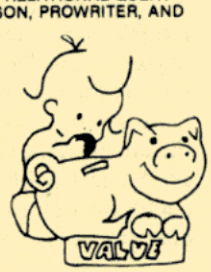

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the process. The gate signal doesn't affect the counter output in this mode. Figure 5 shows a sample timing diagram for mode 1 operation.

Mode 2 (a programmable rate generator) is a divide-by-N counter. The chip divides the input clock frequency by the count value sent to the counter, with the output pulsing at the divided frequency. The output goes low for one clock period, then high again. The gate input must be high to enable counting. This mode is often used to generate a periodic interrupt or timing for a regular, periodic event. A sample timing diagram for mode 2 operation is shown in Fig. 6.

Mode 3 (square wave mode) is typically used for baud-rate generation. Unlike mode 2, the output changes (toggles) at each half-count of the counter. For example, if the count value is 100, the output goes high for 50 counts, then low for 50 counts. If the count value is odd, the output goes high for one count longer than it is low. The gate input must be high for counting to take place. Figure 7 shows a sample mode 3 timing diagram.

In mode 4 (software triggered strobe), the chip's output initially goes high when it loads the counter. When the counter reaches zero, the output goes low for one clock cycle, then goes high again. To retrigger the counter, you must write a new count value to it. Counting is enabled only when the gate goes high, but the gate has no effect on the output. Figure 8 shows a sample timing diagram for mode 4 operation.

Mode 5 is similar to mode 4, except that the rising edge of the gate input triggers the counting, instead of a software write of the count value. When the count value reaches zero, the output goes low for one clock cycle, then returns high, awaiting another gate trigger. Thus the counter is retriggerable. If the gate input has another rising edge, the chip automatically loads the initial count value into the counter on the next clock, thereby starting the countdown all over. A sample timing diagram for mode 5 is shown in Fig. 9.

Configuring and Operating The 8253/8254

The control-word format for the 8254 is shown in Fig. 10. The high-order 2 bits (bits 6 and 7) specify which of the three counter/timers you're set-

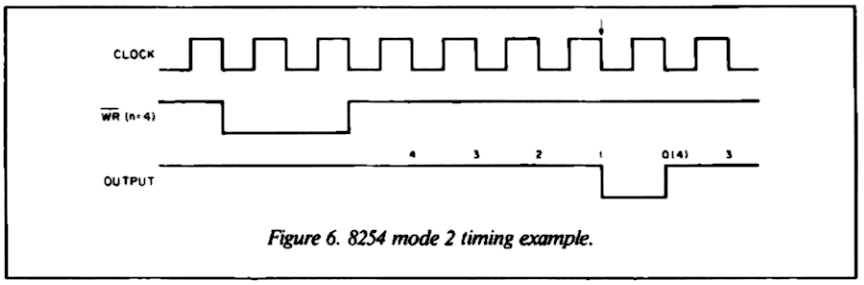

Figure 6. 8254 mode 2 timing example.

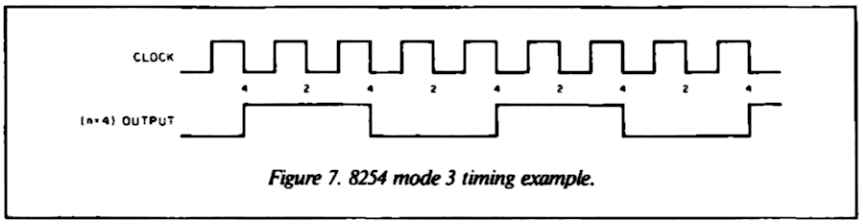

Figure 7. 8254 mode 3 timing example.

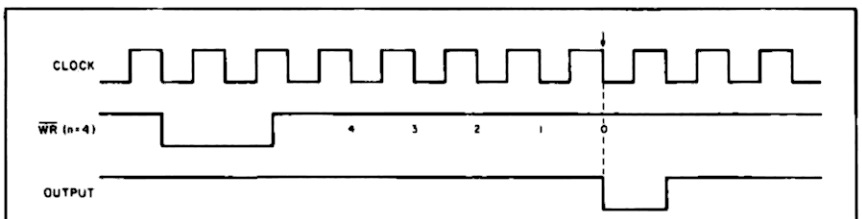

Figure 8. 8254 mode 4 timing example.

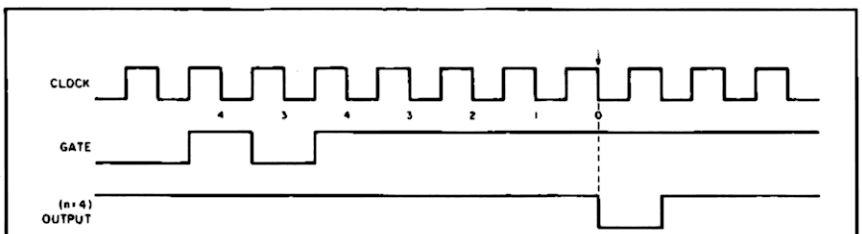

Figure 9. 8254 mode 5 timing example.

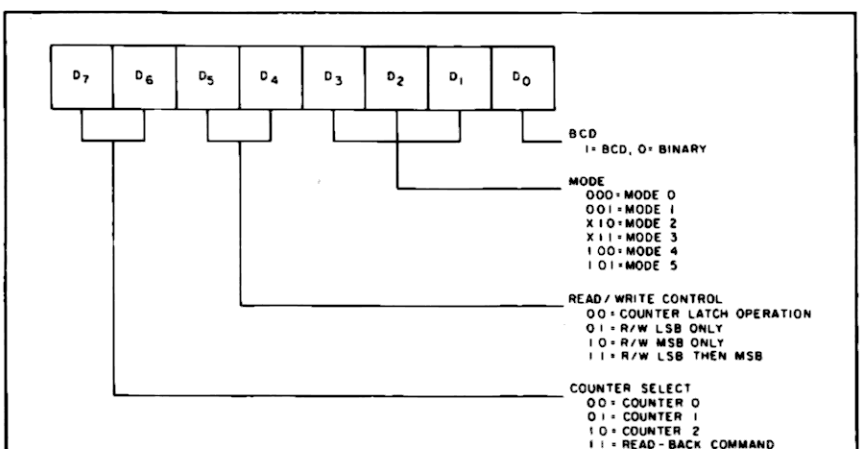

Figure 10. 8254 control word format.

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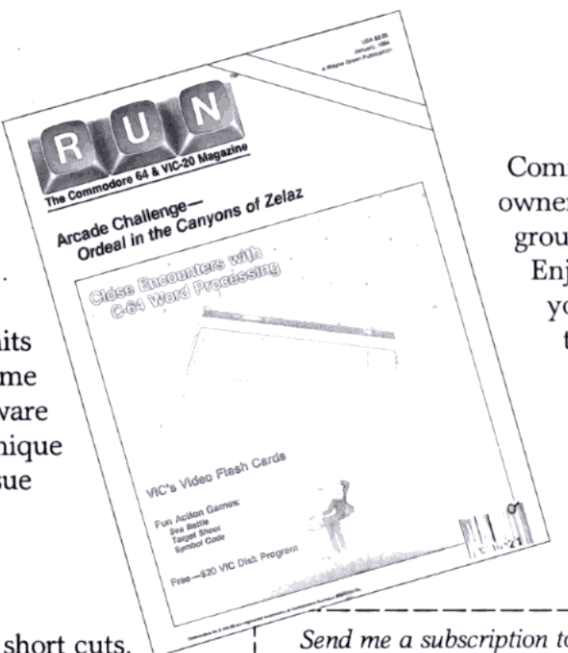

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ting up. In the 8254, these bits may also specify a "read-back command" mode, which is unavailable on the 8253. Bits 4 and 5 determine the count-value read/write mode. You have the option to read or write the most significant byte only, the least significant byte only, or the least significant byte followed by the most significant byte. Bits 1, 2, and 3 specify the timer operation mode (zero to 5), and bit zero specifies either straight binary or binary-coded decimal (BCD) counting.

You may want to read the value of a particular counter. Since the counter is a dynamic register, it may change as the processor reads it. To prevent this, a read latch option is available. If bits 4 and 5 of the control byte are both zeros, the 8253/8254 latches the current count value of the specified counter into a temporary register, letting you read it without the count value changing. You should use this approach when you read a counter.

Address selection takes place at the two inverters at the 74LS138 inputs.

Building the I/O Board

Figure 11 shows the I/O board schematics (see Table 1 for a parts list). Address selection takes place at the two inverters at the 74LS138 inputs. The dotted lines show the configuration I used (*** shown below). The possible addresses are as follows:

A6/	A5/	40–47 hexadecimal
A6/	A5	60–67 hexadecimal
A6	A5/	00–07 hexadecimal
A6	A5	20–27 hexadecimal ***

The first four addresses of the range (20–23 hexadecimal [hex]) belong to the 8255A, while the remaining four addresses (24–27 hex) belong to the 8253/8254.

A 50-pin header connector is used as the I/O connector, letting you connect this board to other boards as needed. The connector has 16 I/O signals from the 8255A going to it—all of ports A and C—as well as the three counter outputs, the three gate inputs, and one clock input (to counter 2). The gate input signals are pulled up with resistors so you can still use the respective counters without connecting a device to the expansion connec-

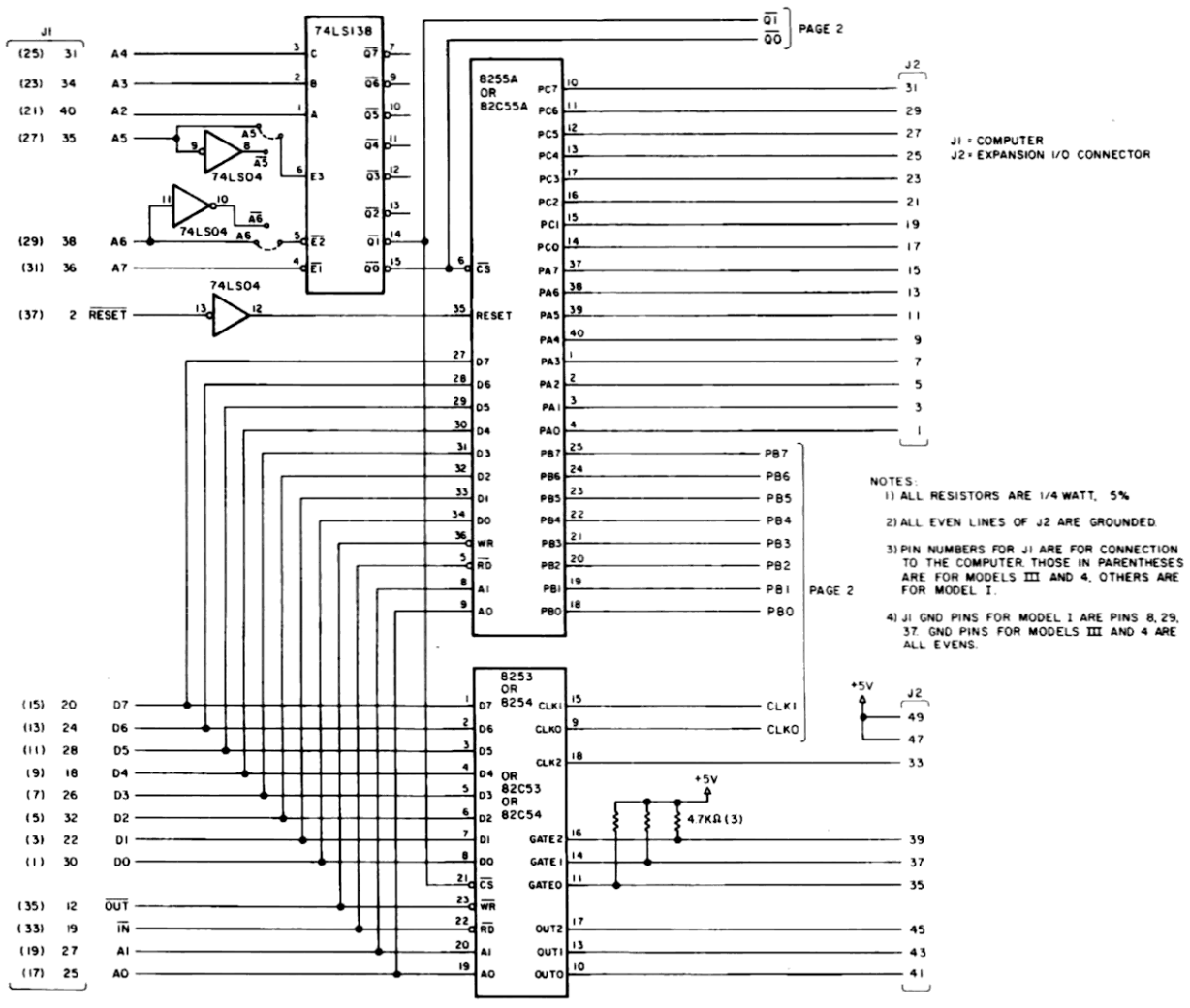

Figure 11a. Schematic for general-purpose I/O board Part 1 (p.1).

tor. Two lines also go to +5V, so an external board can have a logic supply. The chips should draw no more than 50mA of current from each line, and the external board should have a local filtering capacitor to reduce noise if you used the +5V supply.

The crystal oscillator generates a reference frequency for counters zero and 1 of the 8254, which the 74LS193 divides down to shunt various frequencies to the 8254 counters. With the 4 MHz crystal shown, the 8254 receives a maximum frequency of 2 MHz. While this is the maximum allowed by the 8253, the 8254 permits up to 8 MHz. You can lower or raise the crystal frequency as necessary to meet your own requirements.

The 2 MHz clock seems to give a good general-purpose set of frequencies, since this makes available to the 8254 counters four "average" frequencies: 2 MHz, 1 MHz, 500 kHz, and 250 kHz.

The I/O board also has a single-digit seven-segment display. This lets you display a one-digit status indicator, if needed. Between the counter frequency selection and the seven-segment display, the 8 bits from the 8255A port B are used.

In addition to the parts shown in the schematic, you will also need a power supply. The current requirement depends upon whether you use CMOS devices and whether an external board draws current from the I/O board. Worst-case current draw is around 500mA.

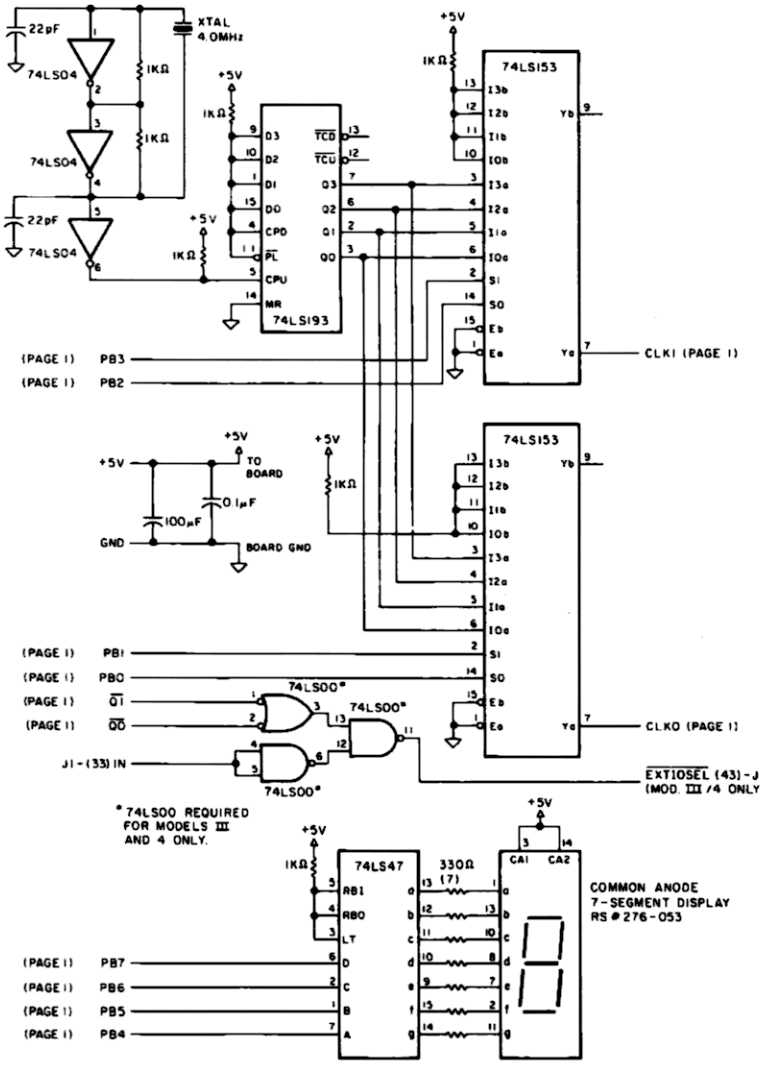

Figure 11b. Schematic for general-purpose I/O board Part 2 (p.2).

The parts list specifies the standard MOS parts. The 82C55A and 82C54 are made by both Harris and OKI Semiconductor, while the 82C53 is made only by OKI. For information on availability, distributors, and price, contact the respective companies.

Using the I/O Board

As indicated, the port A and port C bits are available at the 50-pin I/O connector. This lets you use any of the three possible 8255A operation modes. Also, the I/O board uses all 8 bits of port B on the 8255A to control on-board functions and options.

The four high-order bits (bits 4-7) control the seven-segment display. These go to the input of a 74LS47 BCD-to-seven-segment decoder chip. The 74LS47 converts the BCD value at its inputs into proper segment-on/-off conditions at its outputs, thus displaying the appropriate digit.

Since the board requires BCD digits in the decimal range zero to 9, binary values outside this range (10–15 decimal) cause other, predetermined, patterns to appear on the display. These patterns are described in the data sheet for the 74LS47.

Don't be alarmed if the digit doesn't light up when you apply power to the board. When the board is first initialized, the 8255A places all of its I/O lines into the input mode. The inputs to the 74LS47 float high (all 1's) and the 74LS47 causes all segments to be off when all four inputs are high.

Only one of the three counter clock inputs goes to the I/O connector, with the remaining two used on-board. You can change this if necessary for a particular application. For added versatility, I designed the board to give counters zero and 1 a choice of four possible clock input frequencies, all under software control. Using the 4 MHz crystal shown in the schematics, the four frequencies are 2 MHz, 1 MHz, 500 kHz, and 250 kHz.

The 8255A uses port B to choose the frequency for each counter. Bits zero and 1 select the frequency for counter zero, while bits 2 and 3 select the frequency for counter 1. The 74LS193 is a 4-bit binary counter, which divides the 4 MHz input frequency into the four possible counter frequencies. Each 74LS153 then selects one of the four available frequencies (based on the 2-bit select code at its S0 and S1 in-

puts from the respective port B bits) to transfer to the appropriate 8254 clock input. The select codes and the corresponding output frequencies are:

0	0	2 MHz
0	1	1 MHz
1	0	500 kHz
1	1	250 kHz

By programming the proper port B output values, you can individually set the frequency input to counters zero and 1 at any of these four frequencies.

You can use both the 8255A and the 8254 to interrupt the processor. If you have an application requiring interrupts, you can wire the appropriate interrupt signal to the TRS-80 interrupt line through an open-collector gate, such as the 7406 (inverting). Make sure the interrupt polarity is correct so that an active interrupt signal is low.

You could connect any of a multitude of different application boards to the I/O connector for your computer to control. One simple board might have terminal blocks with the 16 I/O lines connected for easy input and output to TTL-type (or CMOS-type) devices. This type of board is particularly useful for prototyping circuits, where I/O is needed. I think I'll build such a board for myself.

Quantity	Description	Distributor	Part Number	Price (each)
1	8255A programmable peripheral interface IC *	JDR	8255	4.49
1	8253 programmable interval timer IC * †	JDR	8253	6.95
1	74LS138 3-to-8 decoder IC	JDR	74LS138	.55
1	74LS04 hex inverter (LS TTL) IC	JDR	74LS04	.24
1	74LS193 binary up/down counter (LS TTL) IC	JDR	74LS193	.79
2	74LS153 dual 4-line to 1-line MUX (LS TTL) IC	JDR	74LS153	.55
1	74LS00 quad two-input nand gate (LS TTL) IC ‡	JDR	74LS00	.24
1	.3 inch seven-segment red LED display (com. anode)	RS	276-053	1.79
7	330 ohm resistor (¼ watt)	RS	271-1315	.08
7	1k ohm resistor (¼ watt)	RS	271-1321	.08
2	22 pF capacitors	JDR		.05
3	4.7k ohm resistor (¼ watt)	RS	271-1330	.08
1	50-pos. cable header (w/w)	DK	R247-ND	6.93
1	4.0 MHz crystal	DK	X006	2.95
1	100 μF/35V electrolytic capacitor (PC mount)	RS	272-1028	.79
1	.1 μF/50V disk capacitor	RS	272-135	.25
1	.1 inch matrix grid proto board (dual size)	RS	276-161	2.95
1	40-position cable header (w/w) §	DK	R241-ND	5.58
1	40-position ribbon cable edge connector §	DK	R503-ND	3.80
1	40-position ribbon cable socket connector §	DK	R306-ND	3.73
1 ft.	40-conductor ribbon cable §	DK	R007-ND	0.00
1	50-position cable header (w/w) ‡	DK	R247-ND	6.93
1	50-position ribbon cable edge connector ‡	RS	276-1566	4.95
1	50-position ribbon cable socket connector ‡	DK	R307-ND	4.65
1 ft.	50-conductor ribbon cable ‡	DK	R008-ND	0.00

* CMOS parts also available
† 8254 part also available (see text).
‡ Models III/4 only.
§ Model I only.

Addresses

JDR Microdevices, 1224 S. Bascom Avenue, San Jose, CA 95128, 800-538-5000 or 408-995-5430 outside California; 800-662-6279 inside California

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Table 1. Parts list and ordering information.

Controlling Software

Models III and 4 users must be particularly careful to write a 10 hex value (16 decimal) to I/O port 0EC hex (236 decimal) to enable access to the external TRS-80 I/O port.

While most applications will have specific set-up commands for the board within the controlling software, I've written a general program that sets up all the devices and options on the I/O board (see the Program Listing).

First you select the desired 8255A mode. The program then asks you for the input/output configuration of the 8255A ports. After the 8255A is configured, you're prompted for the digit you want to appear on the seven-segment display, which the program then sets up.

Once the board completes the processing, you enter the counter/timer portion of the program. You can set any or none of the 8253/8254 counters. If you configure any counters, you enter the counter mode as well as the initial count value. For counter zero or 1, you also enter the input frequency to the timer.

Power Consumption

If you're interested in the power consumption difference between the MOS and CMOS parts, here are the specs: The maximum power consumption for the 8255A and the 8254 are 600 mWs and 700 mWs, respectively. The maximum power consumption for both the 82C55A and the 82C54 is roughly 55 milliamps, with each having a 55 microwatt maximum standby power consumption. ■

IC	Ground	+5V
74LS04	7	14
74LS138	8	16
74LS47	8	16
74LS153	8	16
74LS193	8	16
74LS00	7	14
8253	12	24
8255	7	26

Table 2. Power and ground connections for the I/O board.

REFERENCES

1983 Intel Microprocessor and Peripheral Handbook
Intel Corporation
3065 Bowers Ave.
Santa Clara, CA 95051

1984 Harris CMOS Digital Data Book
Harris CMOS Digital Products Division
Mail Stop 53-035
P.O. Box 883
Melbourne, FL 32902-0883

The TTL Data Book for Design Engineers
Texas Instruments Inc.
6000 Denton Drive
P.O. Box 5012
Mail Stop 366
Dallas, TX 75222

OKI Semiconductor
Suite 401
1333 Lawrence Expy.
Santa Clara, CA 95051

Program Listing. Controlling software.

```
10 '*************************************************************
20 '     This program allows the user to easily configure the *
30 ' general-purpose I/O card for many applications. The      *
40 ' program will prompt the user first for the mode and      *
50 ' configuration of the 8255A (or 82C55A) and will set up   *
60 ' the 8255A accordingly. The program will then allow the   *
70 ' user to optionally set up any or all of the three timers *
80 ' in the 8253. When selecting timers zero or one, the user *
90 ' is also asked which of the four possible frequencies he  *
100 ' wishes to go into the timer's clock input line. The     *
110 ' program will then set up the respective 8253 timers, as *
120 ' appropriate.                                            *
130 '                                                         *
140 '     Created by Roger C. Alford                          *
150 '*************************************************************
160 '
170 '
200 '*========== MAIN CONTROLLING CODE SECTION ==========*
210 GOSUB 1000                  'CONFIGURE THE 8255A PPI
215 CLS
220 INPUT "DO YOU WISH TO SET UP ANY OF THE TIMERS (Y/N) ";A$
230 IF A$="N" THEN 260
240 IF A$<>"Y" THEN 220
250 GOSUB 5000                  'CONFIGURE THE 8253 PIT
260 END
270 '-------------------------------------------------------
280 '
1000 '*========== 8255A CONFIGURATION CODE ==========*
1010 CLS:PRINT "THE 8255A MODE OPTIONS ARE:"
1020 PRINT "     0) MODE 0 - BASIC INPUT/OUTPUT"
1030 PRINT "     1) MODE 1 - STROBED INPUT/OUTPUT"
1040 PRINT "     2) MODE 2 - BI-DIRECTIONAL BUS"
1050 INPUT "SELECT DESIRED (PORT A) MODE ";M
1060 M=M+1
1070 IF M<1 OR M>3 THEN 1010
1080 ON M GOSUB 2000,3000,4000
1085 GOSUB 12000                'SET-UP 7-SEGMENT DISPLAY
1090 RETURN
1100 '-------------------------------------------------
1110 '
2000 '*========== 8255A MODE 0 CONFIGURATION CODE ==========*
2010 CLS:PRINT "8255A MODE 0 CONFIGURATION"
2015 PRINT "   (PORT B IS AUTOMATICALLY MADE OUTPUT)"
2020 PRINT:PRINT
2030 INPUT "WOULD YOU LIKE PORT A TO BE INPUT OR OUTPUT (I/O) ";I$
2040 IF I$<>"I" AND I$<>"O" THEN 2030
2050 INPUT "WOULD YOU LIKE PORT CL TO BE INPUT OR OUTPUT (I/O) ";J$
2060 IF J$<>"I" AND J$<>"O" THEN 2050
2070 INPUT "WOULD YOU LIKE PORT CH TO BE INPUT OR OUTPUT (I/O) ";K$
2080 IF K$<>"I" AND K$<>"O" THEN 2070
2090 CW=128
2100 IF I$="I" THEN CW=CW+16
2110 IF J$="I" THEN CW=CW+1
2120 IF K$="I" THEN CW=CW+8
2130 OUT 35,CW                  'SEND THE 8255A CONTROL WORD
2140 RETURN
2150 '-------------------------------------------------------
2160 '
3000 '*========== 8255A MODE 1 CONFIGURATION CODE ==========*
3010 CLS:PRINT "8255A MODE 1 CONFIGURATION"
3013 PRINT "     (PORT B IS AUTOMATICALLY MADE MODE 0 OUTPUT)"
3015 PRINT "     (PORT C BITS 4&5 OR 6&7 WILL BE FREE FOR G.P. I/O)"
3020 PRINT:PRINT
3030 INPUT "WOULD YOU LIKE PORT A TO BE INPUT OR OUTPUT (I/O) ";I$
3040 IF I$<>"I" AND I$<>"O" THEN 3030
3050 IF I$="O" THEN T$=" 4&5 " ELSE T$=" 6&7 "
3060 PRINT "WOULD YOU LIKE PORT C BITS";T$;"TO BE INPUT OR OUTPUT (I/O) ";
3065 INPUT J$
3070 IF J$<>"I" AND J$<>"O" THEN 3060
3080 CW=160
3090 IF I$="I" THEN CW=CW+16
3100 IF J$="I" THEN CW=CW+8
3110 OUT 35,CW                  'SEND THE 8255A CONTROL WORD
3120 RETURN
3130 '-------------------------------------------------------
3140 '
4000 '*========== 8255A MODE 2 CONFIGURATION CODE ==========*
```

Listing continued

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Listing continued

```
4010 CLS:PRINT "8255A MODE 2 CONFIGURATION"
4020 PRINT "     (PORT B IS AUTOMATICALLY MADE OUTPUT)"
4030 PRINT "     (PORT C BITS 0-2 WILL BE FREE FOR G.P. I/O)"
4040 PRINT:PRINT
4050 INPUT "WOULD YOU LIKE PORT C BITS 0-2 TO BE INPUT
     OR OUTPUT (I/O) ";I$
4060 IF I$<>"I" AND I$<>"O" THEN 4050
4070 IF I$="I" THEN CW=193 ELSE CW=192
4080 OUT 35,CW                    'SEND THE 8255A CONTROL WORD
4090 RETURN
4100 '-----------------------------------------------------
4110 '
5000 '*========== 8253 CONFIGURATION CODE ==========*
5010 CLS:PRINT "YOUR OPTIONS ARE:"
5020 PRINT "     0) SET TIMER 0"
5030 PRINT "     1) SET TIMER 1"
5040 PRINT "     2) SET TIMER 2"
5050 PRINT "     3) EXIT"
5060 INPUT "ENTER YOUR SELECTION ";M
5070 M=M+1
5080 IF M<1 OR M>4 THEN 5060
5090 IF M=4 THEN 5120
5100 ON M GOSUB 6000,7000,8000
5110 GOTO 5010
5120 RETURN
5130 '-----------------------------------------------
5140 '
6000 '*========== 8253 TIMER 0 CONFIGURATION CODE ==========*
6010 T=0:T$="0"
6020 GOSUB 9000                   'SET TIMER MODE
6025 GOSUB 13000                  'SET TIMER INPUT FREQUENCY
6030 GOSUB 10000                  'SET INITIAL TIMER COUNT
6040 RETURN
6050 '-----------------------------------------------------
6060 '
7000 '*========== 8253 TIMER 1 CONFIGURATION CODE ==========*
7010 T=1:T$="1"
7020 GOSUB 9000                   'SET TIMER MODE
7025 GOSUB 13000                  'SET TIMER INPUT FREQUENCY
7030 GOSUB 10000                  'SET INITIAL TIMER COUNT
7040 RETURN
7050 '-----------------------------------------------------
7060 '
8000 '*========== 8253 TIMER 2 CONFIGURATION CODE ==========*
8010 T=2:T$="2"
8020 GOSUB 9000                   'SET TIMER MODE
8030 GOSUB 10000                  'SET INITIAL TIMER COUNT
8040 RETURN
8050 '-----------------------------------------------------
8060 '
9000 '*========== 8253 TIMER MODE SELECTION CODE ==========*
9003 CLS:PRINT "8253 TIMER ";T$;" CONFIGURATION"
9005 PRINT:PRINT
9010 PRINT "THE AVAILABLE TIMER MODES ARE:"
9020 PRINT "     0) MODE 0 - INTERRUPT ON TERMINAL COUNT"
9030 PRINT "     1) MODE 1 - PROGRAMMABLE ONE-SHOT"
9040 PRINT "     2) MODE 2 - RATE GENERATOR"
9050 PRINT "     3) MODE 3 - SQUARE WAVE RATE GENERATOR"
9060 PRINT "     4) MODE 4 - SOFTWARE TRIGGERED STROBE"
9070 PRINT "     5) MODE 5 - HARDWARE TRIGGERED STROBE"
9080 INPUT "ENTER THE DESIRED MODE ";MD
9090 IF MD<0 OR MD>5 THEN 9080
9100 GOSUB 11000                  'GET READ/LOAD MODE
9110 CW=T*64+RL*16+MD*2
9120 OUT 39,CW                    'SEND THE TIMER CONTROL WORD
9130 RETURN
9140 '-----------------------------------------------------
9150 '
10000 '*========== 8253 INITIAL COUNT CODE ==========*
10010 CLS:PRINT "8253 TIMER ";T$;" CONFIGURATION"
10020 PRINT:PRINT
10030 INPUT "ENTER INITIAL TIMER COUNT VALUE (-1 FOR NONE) ";IC
10040 IF IC=-1 THEN 10150
10050 IF IC<0 THEN 10030
10060 IF RL<>3 AND IC>255 THEN 10030
10070 IF IC>65535 THEN 10030
10080 IF RL=3 THEN 10110
10090 OUT 36+T,IC                 'SEND INITIAL TIMER COUNT
10100 GOTO 10150
10110 IH=INT(IC/256)              'GET HIGH BYTE OF COUNT VALUE
10120 IL=IC-(IH*256)              'GET LOW BYTE OF COUNT VALUE
10130 OUT 36+T,IL                 'SEND LOW BYTE OF INITIAL COUNT
10140 OUT 36+T,IH                 'SEND HIGH BYTE OF INIT. COUNT
10150 RETURN
10160 '-----------------------------------------------------
10170 '
11000 '*========== 8253 READ/LOAD MODE CODE ==========*
11010 CLS:PRINT "8253 TIMER ";T$;" CONFIGURATION"
11020 PRINT:PRINT
11030 PRINT "THE AVAILABLE READ/LOAD MODES ARE:"
11040 PRINT "     1) READ/LOAD LSB ONLY"
11050 PRINT "     2) READ/LOAD MSB ONLY"
11060 PRINT "     3) READ/LOAD LSB FIRST, THEN MSB"
11070 INPUT "ENTER DESIRED READ/LOAD MODE ";RL
11080 IF RL<1 OR RL>3 THEN 10170
11090 RETURN
11100 '-----------------------------------------------
11110 '
12000 '*========== SET 7-SEGMENT DISPLAY CODE ==========*
12010 CLS:PRINT "7-SEGMENT DISPLAY SET-UP"
12020 PRINT:PRINT
12030 INPUT "ENTER DIGIT TO APPEAR ON THE DISPLAY (0-9) ";DG
12040 IF DG<0 OR DG>9 THEN 12030
12050 OUT 33,DG*16                'SET DISPLAY DIGIT
12060 RETURN
12070 '-----------------------------------------------
12080 '
13000 '*========== SET TIMER INPUT FREQUENCY CODE ==========*
13010 CLS:PRINT "8253 TIMER ";T$;" CONFIGURATION"
13020 PRINT:PRINT
13030 PRINT "THE AVAILABLE TIMER INPUT FREQUENCIES ARE:"
13040 PRINT "     1) 2 MHZ"
13050 PRINT "     2) 1 MHZ"
13060 PRINT "     3) 500 KHZ"
13070 PRINT "     4) 250 KHZ"
13080 INPUT "ENTER THE DESIRED TIMER INPUT FREQUENCY ";TF
13090 IF TF<1 OR TF>4 THEN 13080
13100 TF=TF-1
13105 IF T=1 THEN AV=243 ELSE AV=252
13110 TM=INP(33) AND AV
13120 IF T=1 THEN TF=TF*4
13130 OUT 33,TM+TF
13140 RETURN
13150 '-----------------------------------------------
```

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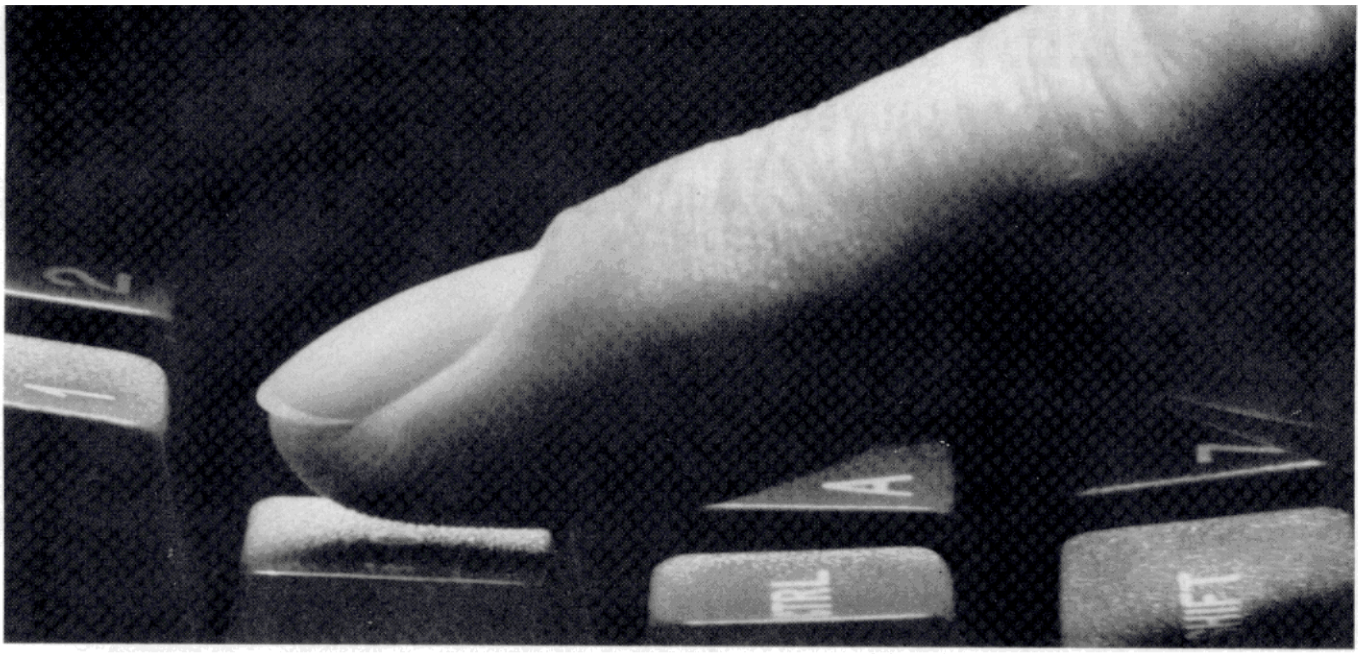

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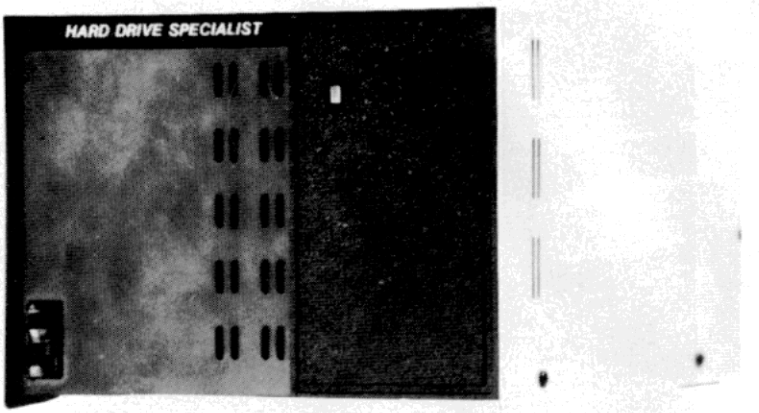

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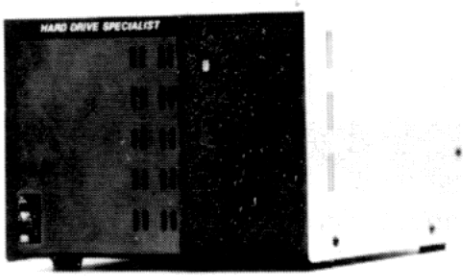

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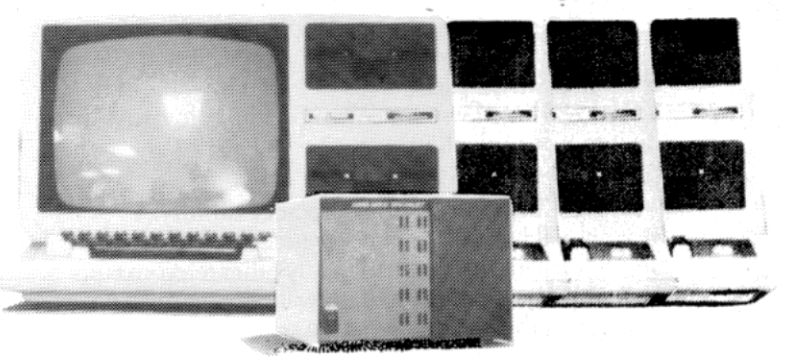

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Using an Index For More Flexibility

The message board is the heart of any BBS. Not only is it where callers communicate with one another, it's the sysop's forum for providing information about the BBS. We've concentrated on storing messages for the last few months; now we'll show you how to read and scan the message board.

Your main priority in developing a program to read the message board is flexibility. This month's programs let you read messages forward, backward, individually, selectively, and those marked specifically for your mailbox.

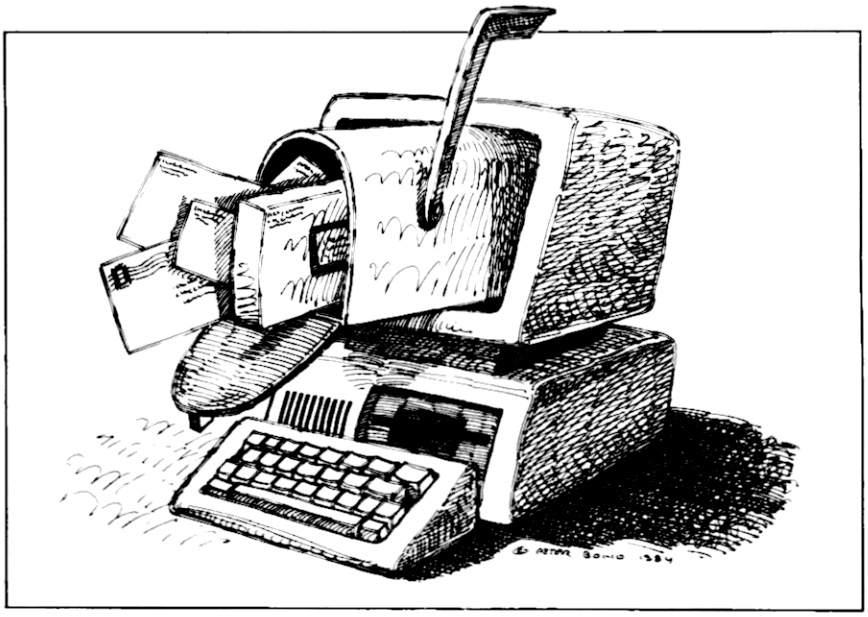

Illustration by Peter Bono

Indexing

Reading messages marked for a mailbox isn't too difficult in terms of programming. When the caller logs on, the BBS Express looks for messages directed to the caller, saves the message's record number in an integer array, and retrieves the message individually in a For...Next loop.

Reading the message board forward, backward, individually, or selectively, however, requires a different technique. The BBS software must find a specific message on the board so that it can go directly to that message, rather than waste time searching through the entire message file (Messages/BBS). You need to develop an index of all the messages that pinpoints the location of a message by record number so that the BBS Express can retrieve it quickly.

The BBS's index holds all the messages' record numbers; it's labeled MN$. Program Listing 1 develops MN$; it's written in machine language because Basic would work too slowly.

MN$ stores a message's record number according to a mathematical formula. You develop the index with the MKI$ command, which does all the record-number calculations for you. By setting MN$ = MKI$(message number), MN$ becomes two characters that represent the record number, in least significant byte/most significant byte format. To maintain the index, MN$ = MN$ + MKI$(message number) is set as users add messages to the board.

This saves you time because you can quickly scan the index for a message number and then get its record number. Once you know the locations and numbers, you can specify the manner in which you want to read the board.

Program Listing 1, the Assembly-language code, locates the message number, while Program Listing 2, in Basic, manipulates this information so that you can read the board in a variety of ways.

How the Index Works

Line 1760 calls PARAM, which returns the starting address for MN$ to the HL register and the length of MN$ to the B register, provided Basic calls this routine with a statement like USR3(VARPTR(MN$)), found in line 430 of Program Listing 2.

While it may seem that line 1770 loads the DE register pair with zero, the Basic program actually POKEs the number of the message you want, in least significant byte/most significant byte format, over the zeros. For example, if you're looking for message 210, line 1770 responds with LD, DE, 210.

The program transfers the index's starting address to the IX register by PUSH HL, POP IX in lines 1780 and 1790. The C register in line 1800 acts

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Program Listing 1. BBS module that creates an index for the message board.

```
01750 ;
01760 FSRCH   CALL    PARAM           ;GET VARPTR(MN$)
01770 SEARCH  LD      DE,0000         ;SEARCH STRING
01780         PUSH    HL
01790         POP     IX
01800         LD      C,255           ;STR. POS. COUNTER
01810 FSR010  LD      L,(IX+0)
01820         LD      H,(IX+1)        ;GET FIRST PAIR FOR CMPR
01830         INC     C
01840         INC     C               ;BUMP STRNG POINTER
01850         BIT     7,H             ;CHECK FOR NEGETIVE
01860         JR      NZ,REVR         ;NEGETIVE - DEAD FILE
01870         RST     18H             ;COMPARE HL/DE
01880         JR      Z,FSR100        ;FOUND
01890         JR      NC,FSR100       ;TARGET>SOURCE
01900 REVR    INC     IX
01910         INC     IX
01920         DEC     B
01930         DJNZ    FSR010          ;LOOP TIL FOUND
01940 FSR100  INC     C               ;STRPOS+1
01950         SRL     C               ;(STRPOS+1)/2
01960         LD      B,0
01970         PUSH    BC
01980         POP     HL
01990         JP      BASIC           ;PASS TO BASIC
02000;
```

End

Program Listing 2. BBS module to read the message board.

```
300 IF LEN(CM$)<=1 THEN C$=CM$:CM$="":RETURN
310 C$=LEFT$(CM$,1):CM$=FNS$(CM$):IF (C$<=CHR$(32)) OR (C$=";") TH
EN 300
320 IF CM$=""THEN RETURN
330 IF (ASC(CM$)<=32) OR (ASC(CM$)=59) THEN CM$=FNS$(CM$):GOTO320
340 RETURN
350 E$=INKEY$:N=VAL(RIGHT$(F2$,4)):T$=T1$:TT$=F1$:S8$=S1$:
S9$=CHR$(ASC(S2$) AND 15):S7$=CHR$(ASC(S2$) AND 240):S6$=MID$("012
3456789ABCDE",ASC(S9$),1)
360 RD=-1:IF FN P(RN,MN$)<0 THEN RD=0
380 IF INSTR(SE$,S6$)=0THEN RD=0
390 IF ((ASC(S7$) AND 32)=32) AND (LEFT$(T$,LEN(NA$))<>NA$) AND (L
EFT$(TT$,LEN(NA$))<>NA$) AND NOTSY THEN RD=0
400 IF (SF$="T" AND INSTR(T$,SS$)=0) OR (SF$="F" AND INSTR(TT$,SS$
)=0) OR (SF$="S" AND INSTR(S8$,SS$)=0) THEN RD=0
410 IF (D$="M") AND (ASC(S7$) AND 16)=16 THEN RD=0
415 IF E$=CHR$(3)THEN RN=E
420 RETURN
430 POKE FD+1,INT(MN/256):POKE FD,MN-(INT(MN/256)*256):S=USR3(VARP
TR(MN$)):RETURN
440 IF (SF) THEN RETURN ELSE RC=0:IF ((LEFT$(T$,5)="SYSOP") AND SY
) OR (LEFT$(T$,LEN(NA$))=NA$) THEN RC=-1
450 K=RC:IF (LEFT$(TT$,LEN(NA$))=NA$) OR (SY) THEN K=-1
460 IF RC THEN S7$=CHR$(ASC(S7$) OR 16):LSET S2$=CHR$(ASC(S7$) OR
ASC(S9$)):PUT 1,RN
465 IF (BM) OR (PR) THEN RETURN
470 PRINT"(C RE T)";:IF K THEN PRINT"(D = DELETE)";
480 IF SY THEN PRINT"(P = PRINT IT)";
490 GOSUB130:PRINTCHR$(17);
500 IF SY AND ASC(I$)=80 THEN PR=-1:GOSUB4720:PR=0:GOTO470
510 IF LEFT$(I$,1)="T" THEN RN=E:RETURN
520 IF LEFT$(I$,2)="RE" THEN 3380
530 IF NOT((LEFT$(I$,1)="D") AND K) THEN 545
540 PRINT"Please confirm delete (y/n)";:GOSUB130:PRINTCHR$(17):IF
ASC(I$)=89 THEN MID$(MN$,2*RN-1,2)=MKI$(-FNP(RN,MN$)):
PRINT"Deleted":MID$(I$,1,1)="C"
545 IF LEFT$(I$,1)="C"THEN RETURN
550 PRINT"C = Continue":PRINT"RE = REply to message":PRINT"T = Top
 (Exit Read Function)":IF K THEN PRINT"D = Delete message"
560 GOTO470
800 PRINT"Section (Tap ENTER for all, ? for list)";:GOSUB130:PRINT
CHR$(17);
810 IF CT=0 THEN SE$=UA$:RETURN
820 IF ASC(I$)=63 THEN GOSUB830:GOTO800
821 SE$=LEFT$(I$,CT):FOR Z=1TOCT:IF INSTR(UA$,MID$(SE$,Z,1))=0THEN
PRINT"Unauthorized to section ";MID$(SE$,Z,1):GOTO800 ELSE NEXT:RE
TURN
```

Listing 2 continued

You can read through the message board in six ways, and you can chain the commands to save time.

as a counter, and starts out at 255. Line 1810 loads the HL register with the first two bytes of MN$, representing the number of the message in the first position. The program then increments C twice; the first increment moves C from 255 to zero, the second from zero to 1.

Line 1850 uses the Bit command to find out if bit 7 of the message number is set. If it is, it's a negative number, which means that the BBS has deleted the message. The program ignores this and jumps to line 1900. If the number is positive, it must be compared with the number in the DE register. Line 1870 calls a Restart command, RST 18H, which compares the HL and DE registers, then sets the proper flags.

If the Restart sets the Z flag, it has found the target message number and the program jumps to FSR100. If the carry flag isn't set, you've passed the target, and the program again jumps to FSR100. Otherwise, you bump IX twice to point to the next message number, decrement B, and loop until the program finds the number.

FSR100 bumps the character counter, register C, by 1, then shifts one position to the right and divides by 2, loading the B register with a zero. Lines 1970 and 1980 transfer this to the HL register and pass the value of the target message on to the Basic code in Program Listing 2. If the target message doesn't exist, the next-largest value is returned to Basic.

Reading Messages

Program Listing 2 lets you read through the message board in six ways: forward (the RF command), in reverse (RR), individually (RI), marked messages (RM), new messages (RN), and selectively (RS).

You can chain these commands, too. This is a real time-saver; for example, if you want to read from message 210 on, issue the R command and wait to be prompted for the direction

and message number. If you prefer to skip the prompts, just type in RF210.

CM$, in line 2870, contains whatever the caller entered at the command prompt. If CM$ is a null string, the program prompts for a subcommand. Otherwise, GOSUB 300 transfers the second character of CM$ to D$.

Line 2900 checks to see if D$ is an authorized command. If it's not, an authorized command summary is printed. If, for example, D$ is N, the caller has asked to read new messages. The program then sets MN, the starting message number, to HM + 1 (HM is the caller's high message number on his last visit). D$ becomes F because you read new messages forward.

CM$ still contains the message number, which line 2940 sets as MN = VAL(CM$). If the value is less than one, the program prompts for the starting message. Otherwise, it jumps to line 2970. Line 2970 sets SE$ to UA$, the user's authorized access, while GOSUB 200 opens Messages/BBS. Unless a caller requests to read individually or marked, the GOSUB 800 prompts for the section numbers to read and validate the caller's choice.

Line 2980 directs each command to its proper routine. Line 2990 is the Read Forward section where the GOSUB 430 sets S equal to the record number containing the requested starting message. E is set to SN, the number of messages on the system.

Line 3000 gets each record in Messages/BBS, starting with Record S. The GOSUB 350 initiates a routine to check whether or not the caller has access to the message. If the message is private, the program prints a period and checks the next message. If the caller does have access to the message, GOSUB 4720 prints it.

If the requested message number is greater than HI, the highest message number on the caller's last visit, HI becomes the present message number. The BBS writes this new HI to disk when the caller closes out.

GOSUB 440 prints four options: continue with the C command, return to the top menu (T), delete the message (if he's the sysop, sender, or addressee), or print the message (if he's the sysop). These closing prompts can be eliminated with brief mode (BM = −1), or if the SYSOP calls for a hard copy (PR = −1).

All of the Read commands are built on the same structure. The one exception is Read Individual, where the exact message must be specified. Line 3090 checks this; if it's not MN, the message doesn't exist on the system. Line 2860 sets SF = −1, which lets you scan the message board. ■

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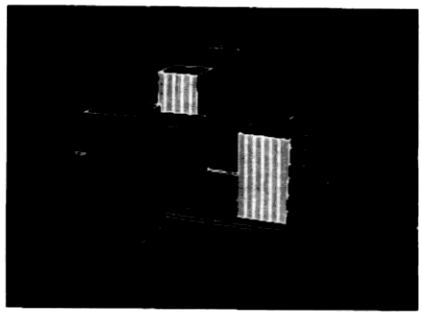

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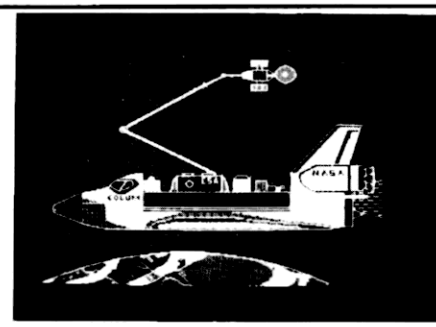

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Listing 2 continued

```
830 FOR Z=1 TO 15:IF (S$(Z)=STRING$(16,32)) OR (INSTR(UA$,MID$(SQ$
    ,Z,1))=0) THEN 850
840 PRINT MID$(SQ$,Z,1);" ";S$(Z)
850 NEXT:RETURN
2850 CLS:PRINTCHR$(12);"Scanning Message Board"
2860 PRINT"Enter a Control-C to stop.":SF=-1
2870 IFCM$<>""THEN2890
2880 PRINT"SUBCOMMAND (? For HELP): ";:GOSUB130:PRINTCHR$(17):IF C
T=0 THEN 1720 ELSE CM$=LEFT$(I$,CT)
2890 GOSUB300:D$=C$:IF D$="M" THEN 2970
2900 IF INSTR("FRISMN",D$)=0 THEN D$="?"
2910 IF D$="?" THEN PRINT"? - Prints this list":PRINT"F - Forward"
:PRINT"R - Reverse"
2920 IF D$="?" THEN PRINT"I - Individual":PRINT"S - Selected":PRIN
T"M - Marked":PRINT"N - New Messages":GOTO2880
2930 IF D$="N" THEN MN=HM+1:D$="F":GOTO2970
2940 MN=VAL(CM$):IF MN>0 THEN 2970
2950 PRINT"System contains messages"SL"to"SH:IF D$="I" THEN PRINT"
Read which message?"; ELSE PRINT"Read starting with which message?
"
2960 GOSUB130:PRINTCHR$(17):MN=VAL(I$)
2970 SE$=UA$:GOSUB220:IF D$<>"I" AND D$<>"M" THEN GOSUB800
2980 ON INSTR("FRISM",D$) GOTO2990,3040,3090,3130,3220
2990 E=SN:GOSUB430
3000 FOR RN=S TO E:GET 1,RN:GOSUB350:IF NOT RD THEN PRINT".";:GOTO
3020
3010 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3020 IF INKEY$=CHR$(3) THEN RN=E
3030 NEXT:GOTO1720
3040 E=1:GOSUB430
3050 FOR RN=S TO E STEP-1:GET 1,RN:GOSUB350:IF NOT RD THEN PRINT".
";:GOTO3070
3060 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3070 IF INKEY$=CHR$(3) THEN RN=E
3080 NEXT:GOTO1720
3090 GOSUB430:IF FN P(S,MN$)<>MN THEN PRINT"NO SUCH MESSAGE":GOTO1
720
3100 RN=S:GET 1,RN:GOSUB350
3110 IF RD THEN GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3120 GOTO1720
3130 PRINT"Search field:(T,F,S)";:GOSUB130:PRINTCHR$(17):IF CT=0 T
HEN 1720 ELSE C$="F"
3140 SF$=LEFT$(I$,1):IF INSTR("TFS",SF$)=0 THEN 3130
3150 PRINT"Search for: ";:GOSUB130:PRINTCHR$(17);
SS$=LEFT$(I$,CT):PRINT"Searching";3160 E=SN:GOSUB430
3170 FOR RN=S TO E:GET 1,RN:GOSUB350:IF NOT RD THEN PRINT".";:GOTO
3200
3180 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3190 PRINT".";
3200 IF INKEY$=CHR$(3) THEN RN=E
3210 NEXT:SF$="":SS$="":GOTO1720
3220 E=PM:IF E=0 THEN PRINT"No Marked Messages":GOTO1720
3230 FOR X=1 TO E:RN=M(X):GET 1,RN:GOSUB350
3240 GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3250 IF LEFT$(I$,1)="T" THEN X=E
3260 IF INKEY$=CHR$(3) THEN X=E
3270 NEXT:GOTO1720
```

End

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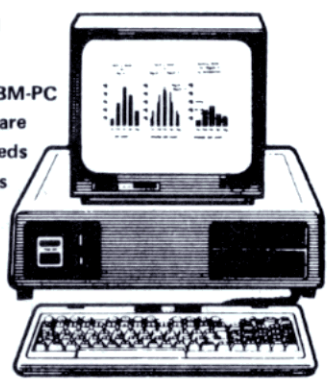

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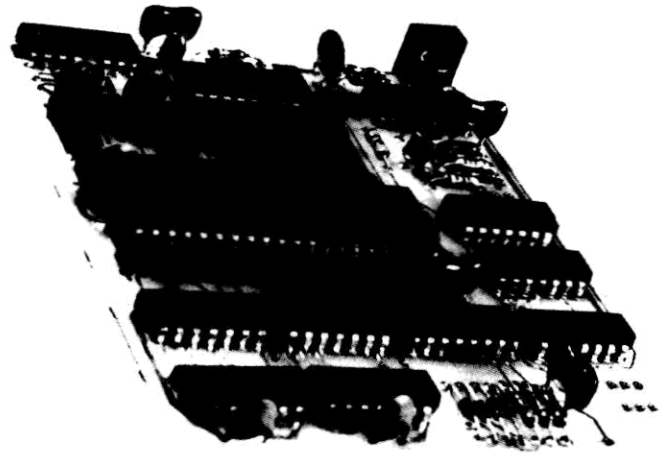

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Pixel Graphics: A Point-by-Point Description

A pixel is what you see on your computer's screen when you type in a period. It's the smallest picture element on the video screen, equivalent to 1 bit of memory.

Your computer has preprogrammed instructions for creating ASCII characters. When you type in the letter A, your computer plots a combination of pixels to display it. Similarly, by using certain Basic statements, you can program pixel displays and thereby create new graphics shapes.

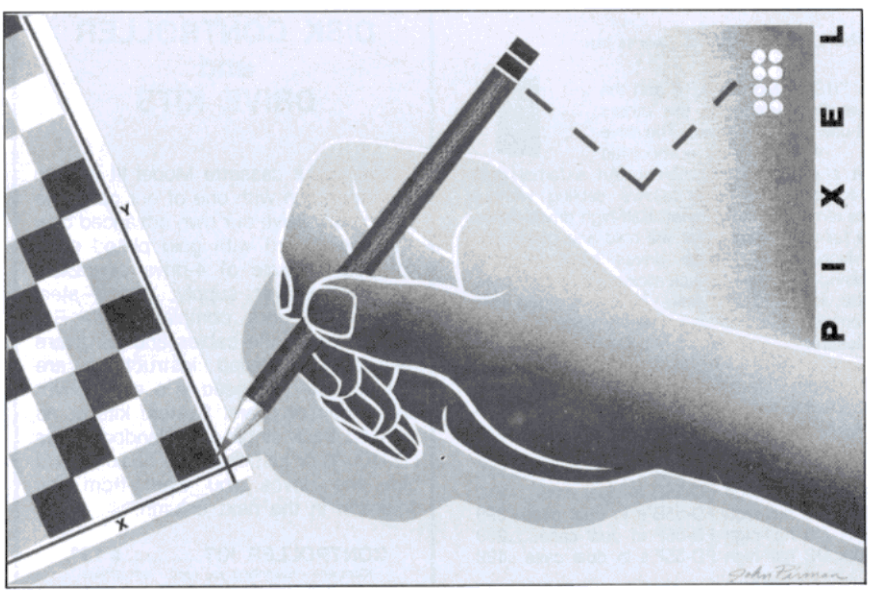

Illustration by John Pirman

Model I/III Pixel Graphics

Using computer pixel graphics is similar to plotting a graph with a pencil and paper. On graph paper you start by drawing an X and Y axis, thereby assigning and identifying every square on the paper with X,Y coordinates.

You identify pixels in the same way. The Model I/III has 128 pixel positions across the screen (0–127), and 48 positions down (0–47), for a total of 6,144 pixel positions. The first position, in the upper left-hand corner, has the coordinates 0,0.

Pixel graphics use two Basic statements and one function. SET(X,Y) turns on a pixel at screen position X,Y. You can also use literals, such as SET(50,20), variables such as SET(VV,R1), or combinations such as SET(23,Y).

The statement RESET(X,Y) turns off the pixel at position X,Y. The POINT(X,Y) function tests whether a pixel is on or off at a given position, and is handy in writing games.

Here are a few examples. Clear your screen (type in CLS and press the enter key) and type in SET(62,23). A pixel light appears near the screen middle. Type in RESET(62,23) and hit the enter key, and the light turns off.

Clear the screen again and type in SET(62,23): PRINT POINT(62,23) and press the enter key. The answer is −1. This means that the light at position 62,23 is on. When it's off, the Point function returns a zero.

Pixel Programs

I combined most demonstration programs this month into one master program. Type in and run the Program Listing. You'll see a menu of five options.

Choose option 1 at the menu prompt to run Four Corners. This program displays flashing pixels in the corners of the screen. The Set statements in lines 220–250 contain their limits. Hit the break key to exit the program.

Now rerun the program and select option 2, Where Now? This program displays a blinking pixel at the screen position you specify. Enter numbers for the X and Y coordinates. If either number is too small or too large, the program prompts you to enter another number. Where Now? asks you for new input after a brief timing loop.

The following program combines pixel settings and Basic commands to show how you can change variables within a program or Set or Reset pixels at different places. It creates a snowstorm by setting pixels randomly:

```
100 REM * SNOW *
110 CLS
120 SET(RND(127),RND(47))
130 GOTO 120
140 END
```

This statement draws a line across the screen:

```
100 CLS: Y = 23: FOR X = 0 TO 127:
SET(X,Y): NEXTX
```

The For...Next loop above incre-

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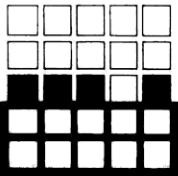

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By using Set and Reset together, you can create animation and simulate a bouncing ball.

ments the X value by one with each pass. Try inserting STEP 2: after 127 and run the statement again. Now it draws a line of dashes.

You can also draw backwards, down, and diagonally in lines 100, 200, and 300:

100 CLS: FOR X = 127 TO 0 STEP −1: SET(X,20): NEXT X

200 CLS: X = 100: FOR Y = 0 TO 47: SET(X,Y): NEXT

300 CLS: FOR X = 0 TO 40: SET(X,Y): Y = Y + 1: NEXT

Try writing a program line that draws in other diagonal directions. You need a For...Next loop (FOR X = 1 TO 27) for one variable, and an increment or decrement (Y = Y − 1) for the other.

Pixel Animation

By using Set and Reset together you can create animation:

100 CLS:FOR X = 0 TO 127; SET(X,Y): FOR T = 1 TO 20: NEXT T: RESET(X,Y): NEXT X

This program line sets each X value in the loop, keeps it lighted for a brief timing loop (FOR T = 1 TO 20), erases it with the Reset statement, and continues.

You can use this technique to simulate a bouncing ball. Run the ball program by selecting option 3 from the main menu. Lines 620–640 draw a surface against which the ball bounces. Line 650 gives B a value of .2. With each bounce, the zenith decreases by 20 percent.

Line 660 sets X equal to position 64, located mid-screen. Two program loops control the mechanics of the bounce: The drop is in lines 670–720, and the bounce in lines 740–780.

Variable Z in line 730 represents the zenith of the bounce. The zenith decreases with each bounce. During each loop, the program sets the ball, GOSUBs to a timer loop at line 800, and resets. The ball runs out of steam when variable Z reaches 46, and the program ends.

Program Listing. Master listing of example programs.

```
100 REM * BASIC TAKES #5 - PIXEL GRAPHICS
110 REM * MASTER LISTING FOR MODELS I AND III
120 CLS
130 PRINT "MENU:"
140 PRINT "1 - FOUR CORNERS"
145 PRINT "2 - WHERE NOW?"
150 PRINT "3 - BALL"
155 PRINT "4 - GRAPH"
160 PRINT "5 - RAMBLER"
165 INPUT Q
170 CLS
175 ON Q GOTO 200,400,600,900,1300
180 GOTO 120
199 REM -----------------------------------
200 REM * FOUR CORNERS *
210 CLS
220 SET(0,0)
230 SET(127,0)
240 SET(0,47)
250 SET(127,47)
260 GOSUB 300
270 CLS
280 GOSUB 300
290 GOTO 210
300 FOR T=1 TO 100
310 NEXT T
320 RETURN
330 END
399 REM -----------------------------------
400 REM * WHERE NOW? *
410 CLS
420 PRINT "WHERE NOW?"
430 INPUT "ACROSS POSITION - X";X
440 IF X<0 THEN PRINT "TOO LOW" ELSE IF X>127 THEN PRINT "TOO HIGH"
450 IF X<0 OR X>127 THEN 430
460 INPUT "DOWN POSITION - Y";Y
470 IF Y<0 THEN PRINT "TOO LOW" ELSE IF Y>47 THEN PRINT "TOO HIGH"
480 IF Y<0 OR Y>47 THEN 460
490 CLS
500 SET(X,Y)
510 IF Y>6 THEN Z=0 ELSE Z=256
520 PRINT @ Z,"X"X" Y"Y;
530 FOR T=1 TO 20
540 IF T/2<>INT(T/2) THEN RESET(X,Y) ELSE SET(X,Y)
550 FOR V=1 TO 100
560 NEXT V,T
570 GOTO 410
580 END
599 REM -----------------------------------
600 REM * BALL *
610 CLS
620 FOR X=0 TO 127
630 SET(X,47)
640 NEXT X
650 B=.2
660 X=64
670 FOR Y=Z TO 46
680 SET(X,Y)
690 IF Y=Z THEN FOR T=1 TO 25: NEXT T
700 GOSUB 800
710 RESET(X,Y)
720 NEXT Y
730 Z=Z+(47-Z)*B
740 FOR Y=46 TO Z STEP -1
750 SET(X,Y)
760 IF Y<42 THEN GOSUB 800
770 IF Z<46 THEN RESET(X,Y) ELSE PRINT @ 0,"BALL IS OUT OF BOUNCE"
: END
780 NEXT Y
790 GOTO 670
800 FOR T=1 TO 2
810 NEXT T
820 RETURN
830 END
899 REM -----------------------------------
900 REM * GRAPH *
910 CLS
920 CLEAR 500
930 DEFSTR A-B
940 DIM G(12)
950 A="JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"
960 INPUT "NAME OF GRAPH";C$
970 D=1
980 FOR E=1 TO 12
990 PRINT MID$(A,D,3)" FIGURE";
1000 INPUT G(E)
1010 IF G(E)>100 THEN PRINT "100 IS LIMIT. TRY AGAIN.": GOTO 990
1020 D=D+3
1030 NEXT E
1040 CLS
1050 PRINT C$
1060 PRINT STRING$(LEN(C$),"-")
1070 X=7
1080 Y=7
1090 E=1
```

Listing continued

Mixing Text and Graphics

Combining graphics with text requires more care when positioning pixels and involves some experimentation. Pixel and PRINT@ graphics are similar. Each PRINT@ graphics character comprises six pixels, two across by three down.

Pixel graphics set and reset 6,144 screen positions. PRINT@ graphics print character strings from CHR$(128) to CHR$(191) in 1,024 screen positions.

To mix text and graphics you must determine the relationship among the different elements. You can do this by experimenting. Try running this listing:

```
100 REM * EXPERIMENT *
110 CLS: SET(58,21)
120 INPUT "PRINT@ NUMBER";B
130 PRINT@ B, CHR$(60);"HERE"
140 PRINT@ 0,"";: END
```

This program sets a pixel on the screen, then displays the prompt "PRINT@ NUMBER". Enter a numerical guess for the pixel's PRINT@ position. The program displays a right arrow followed by the word HERE.

You can use Point in game programs to determine when a character runs into something. Rambler is a challenging game that should give you some ideas for using Point.

Try to make the arrow point at the pixel. Hit the break key and run the program again to make another guess.

The Graph program (option 4) in lines 900–1220 shows an application using pixels and text. Answer the prompt "Name of Graph?" and enter numbers between zero and 100 for the 12 prompts for each month of the year. The program then prints the figures for each month and graphs them.

Refer to the Program Listing to see how I made the pixel lines. The loop in lines 980–1030 asks you to enter a figure. The entry becomes G(E), with E running from 1 to 12 months.

The loop in lines 1110–1210 prints the month at the left and the figure to the right of the graph. A loop within this loop (lines 1140–1160) prints the pixel line representing the figure.

Getting to the Point

The Point statement can test any pixel position and direct control of your program based on whether the pixel is on or off. The statement IF POINT(62,43) = 0 THEN GOSUB 1000 executes a GOSUB when the pixel at 62,43 is off.

You can use Point in game programs to determine when a character runs into something. Rambler (option 5 in the main menu) demonstrates this use of Point (lines 1300–1580).

The game starts with a growing trail from the top left of the screen. Press the A key to direct the trail up, the Z key for down, the comma key for left, and the period key to move right. Make as many turns as possible without letting the growing trail run into anything.

Each change of direction scores one point. When you run into a character graphic, the screen frame, or your trail, the game ends and displays your score.

Rambler begins with a difficulty level prompt. Type in a number between 50 and 100. Rambler then sets character graphics on the screen in a mine field situation and draws a picture frame.

The value of variable B is 1, 2, 3, or 4, depending on which directional key you press. Line 1440 contains the POINT tests that control game movement.

If B = 1 (the trail is moving up) and POINT(X,Y − 1) = 1, then the light is on just above the last pixel position set and the game ends. The line contains four Point tests, one for each direction.

Rambler is an example of a challenging game put together in just 28 program lines. It should give you some of your own ideas for using Point.

In my next column I'll discuss arrays. ■

Listing continued

```
1100 D=1
1110 FOR F=128 TO 832 STEP 64
1120 PRINT @ F,MID$(A,D,3);
1130 PRINT @ F+5+G(E)/2,G(E);
1140 FOR X1=X TO X+G(E)
1150 SET(X1,Y)
1160 NEXT X1
1170 X=7
1180 E=E+1
1190 D=D+3
1200 Y=Y+3
1210 NEXT F
1220 END
1299 REM ----------------------------------
1300 REM * RAMBLER *
1310 CLS
1320 DEFSTR Z
1330 INPUT "DIFFICULTY LEVEL - 50 TO 100";A
1340 IF A<50 OR A>100 THEN CLS: PRINT "ILLEGAL LEVEL. AGAIN, PLEAS
E": GOTO 1330
1350 CLS
1360 FOR B=1 TO A
1370 PRINT @ 70+RND(952),CHR$(128+RND(63));
1380 NEXT B
1390 FOR X=0 TO 127: SET(X,0): SET(X,47): NEXT X
1400 FOR Y=1 TO 46: SET(0,Y): SET(127,Y): NEXT Y
1410 X=3: Y=3: B=4: S=-1
1420 Z=INKEY$
1430 SET(X,Y)
1440 IF B=1 AND POINT(X,Y-1)=-1 OR B=2 AND POINT(X,Y+1)=-1 OR B=3
AND POINT(X-1,Y)=-1 OR B=4 AND POINT(X+1,Y)=-1 THEN 1550
1450 IF Z="" THEN 1470
1460 IF Z="A" THEN B=1 ELSE IF Z="Z" THEN B=2 ELSE IF Z="," THEN B
=3 ELSE IF Z="." THEN B=4
1470 IF B1<>B THEN S=S+1
1480 ON B GOSUB 1510,1520,1530,1540
1490 B1=B
1500 GOTO 1420
1510 Y=Y-1: RETURN
1520 Y=Y+1: RETURN
1530 X=X-1: RETURN
1540 X=X+1: RETURN
1550 IF Y>20 THEN V=0 ELSE V=832
1560 FOR T=1 TO 500: NEXT T
1570 PRINT @ V,"FINAL SCORE";S;
1580 END
```

End

You can reach Richard Ramella at 1493 Mt. View Ave., Chico, CA 95926.

Summing It Up: An Advanced Math Program

This is the final installment of Pascalculations. In the last seven months I've covered the fundamentals of the Pascal language. You've learned how Pascal's flexible data types and modular structure make programming easier. This month, I'll discuss an advanced program that exploits these features.

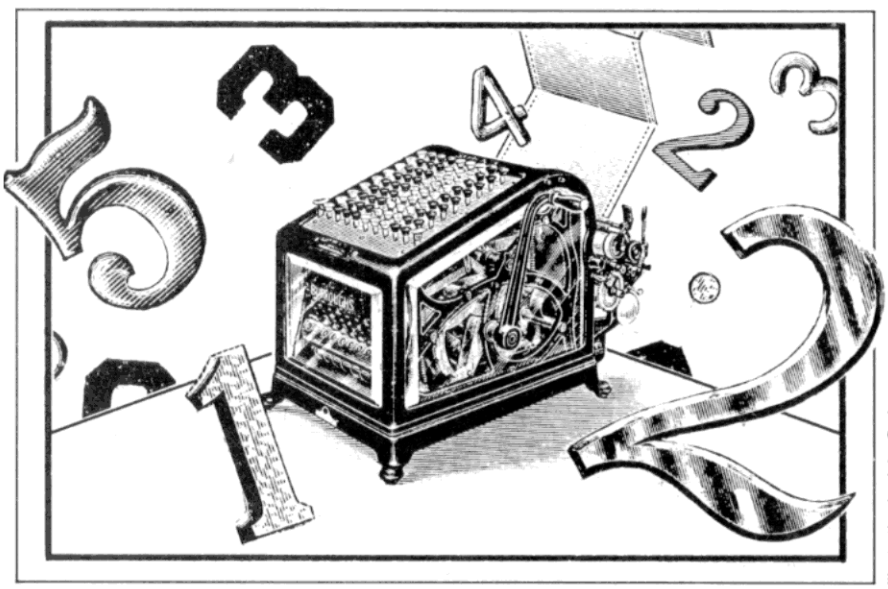

Illustration by John Craig

Math Media

The Calculate program evaluates arithmetic expressions and maintains a list of variables and their values. It's based on a program in the excellent book *Pascal for Basic Programmers*, by Charles Seiter and Robert Weiss. They developed their program from one in *Pascal User Manual and Report*.

The program has two sections. The first part does most of the housecleaning work. It maintains the variable list and passes expressions off to the second part, which does the evaluation. The second section has no program body, and uses the {$Nullbody} compiler option to ensure that no program body is created.

Store the first section in a file called CALC/PCL and the second in a file called EVAL/PCL. You must compile the second part with extra stack space on account of the deep nesting of procedures. The command line PASCAL <6> EVAL tells the compiler to use 6K for the stack space. After you've compiled both sections, link them together (using the Linkload command) along with the Strings/OBJ string library. Then build the program CALC/CMD. The program is then ready to run.

I wrote the program for a Model I or III DOS, which permits the up-arrow character ↑ (a left bracket, [, on the Model III screen) to indicate exponentiation. Model 4 users should substitute another character, such as @, for the power operator.

The Anatomy of an Expression

To evaluate expressions, the EVAL function uses recursion, meaning that a procedure or function calls itself. This works on account of the recursive structure of arithmetic expressions.

For example, 3 + 4 * 5 is an expression. The operator (+) operates on two operands, 3 and 4 * 5. These operands are called terms. The second term, 4 * 5, contains another operator, *, which operates on 4 and 5. The 4 and 5 are called factors.

Now, consider the expression 3 + 4 * (1 + 2). It contains the same operators as the first expression, and therefore must be divided into terms and factors. The second factor of the second term, (1 + 2), is a parenthetical expression. So expressions can contain terms and factors which in turn can contain expressions.

The sequence for evaluating the first expression above (3 + 4 * 5) is:

```
expression = term (3) + term (4 * 5)
           = term (3) + term (factor (4) * factor (5))
           = 3 + term (20)
           = 23
```

The EVAL function of the program uses this basic scheme.

Adding It All Up

When you run the program, you can enter an expression to be evaluated, assign a value to a variable, or list the variables.

The program tests names to determine if they're supported functions. The function SQRT, for example, returns the square root of its argument. If the name is not a supported function, the program assumes it's a variable and searches the variable list.

The variable list is a linked list of record types; in a linked list, each item points to the next. The record type consists of a next pointer, a variable name, and the value of the variable. Initially, the program has three variables. #ANS holds the value of the last

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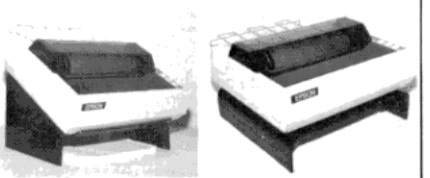

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result. #PI has the value of pi (3.14159). #E has the value of 3, the base for natural logarithms. You can use assignment statements to add variables; the statement SUM = 3 + 4 + 5 assigns the value 12 to the variable called Sum.

If you type in an expression to be evaluated, such as 3 + 4, the program prints the answer, 7, and assigns that value to the variable #ANS. If you enter an expression such as SQRT (SUM), the program searches the variable list for Sum and uses its value in the expression.

The first field in the record type, the next pointer, maintains the variable list. The pointer has the value nil when a variable is the last item on the list; otherwise it points to the next variable. You can add as many variables as memory allows.

The program has a few bells and whistles. You can display a variable list by typing in an exclamation point (!). A colon (:) displays a help menu. The command Quit lets you terminate the program.

A couple of caveats. The program works better if you leave blanks on both sides of a number or variable name. For example, instead of typing in SIN(#PI/2) type in SIN(#PI / 2). Also, you should use uppercase characters. ■

Write to Bruce Powel Douglass c/o 80 Micro, *80 Pine St., Peterborough, NH 03458.*

Program Listing. Calculate program.

```
program calculator;
const    namelen = 4;  varlen = 8; errlen = 12;
label    100;
type     alfa = array [1..errlen] of CHAR;
         Valfa = array [1..VARLEN] of CHAR;
         funcnam = (ABSnam, SQRTnam, EXPnam,
                   SINnam, COSnam, TANnam,
                   ATANnam, ASINnam, ACOSnam, LNnam,
                   LOGnam, INTnam, FACnam, SINHnam,
                   COSHnam);
         V_ptr   = @V_item;
         V_item  = RECORD
                     nextVar : V_ptr;
                     Vname : Valfa;
                     value : REAL;
                   end;
         N_Array = ARRAY [funcnam] OF ARRAY [1..namelen] OF
                  CHAR;
var
  BooBoo  : boolean;
  statement : string;
  i, p   : integer;
  result : real;
  first,ptr,ptrl : V_ptr;
  names  : N_array;
  name   : Valfa;
           {              }
function LEN(S:string): integer; external;
function LEFT$(S:string; POS:integer) : string; external;
function RIGHT$(S:string; POS:integer) : string; external;
function MID$(S:string; POS,LENGTH:integer): string; external;
function DECODER(S:string) :real; external;
function CHARACTER(S:string; POS:integer):CHAR; external;
function CPYSTR(S:string):string; external;
function CONC(S1,S2:string):string; external;
function DELETE(S:string; POS,LENGTH:integer):string; external;
function FIND(SUBS, S:string): integer; external;
function INSERT(SUB,S:string; POS:integer):string; external;
function REPLACE(OLDS,NEWES,S:string):string; external;
         {    }
function EVAL(EXPR:string; VAR BooBoo:boolean;
    first: V_Ptr; VAR names: N_Array): real; external;
         {  }
procedure initializeNames;
begin
  { give names to arithmetic functions }
  names[ABSnam] :=  'ABS ';  names[SQRTnam] := 'SQRT';
  names[EXPnam] :=  'EXP ';  names[SINnam] :=  'SIN ';
  names[COSnam] :=  'COS ';  names[TANnam] :=  'TAN ';
  names[ATANnam] := 'ATN ';  names[ASINnam] := 'ASIN';
  names[ACOSnam] := 'ACOS';  names[LNnam] :=   'LN  ';
  names[LOGnam] :=  'LOG ';
  names[INTnam] :=  'INT ';  names[FACnam] :=  'FAC ';
  names[SINHnam] := 'SINH';  names[COSHnam] := 'COSH';
end;      { end initialize }
           {              }
function DONE : boolean;
  begin
    if find(bldstr('QUIT'),statement)>0 then DONE := TRUE
    else DONE := FALSE;
end;
         {  }
```

Listing continued

Listing continued

```
function LIST(S:string) : boolean;
  begin
  if FIND(BLDSTR('!'),S)>0 then LIST := TRUE
  else LIST := FALSE;
end;
        { }
procedure help;
  begin
  writeln('Your options are: ');
  writeln('  Enter an expression to be evaluated; e.g.,   SIN( 2 * 3 )');
  writeln('  Assign a variable a value; e.g.,             SUM = SQRT ( 89 )');
  writeln('  List the variables by entering               !');
  writeln('  Terminate the program by entering            QUIT');
  writeln('  See the help menu by entering                :');
  end;
        { }
procedure PRTMATH(R:real);
VAR
 T : integer;
begin
  if R=0 then WRITELN(' 0.0 ')
  else begin
    T := TRUNC(LN(ABS(R))/2.303);
    if (T<4) AND (T>-3) then WRITELN(R:9:5-T)
    else WRITELN(R)
  end;
end;
        { }
procedure ListVars(first:V_ptr);
  var
    i : integer;
    item : V_ptr;
  begin
    item := first;
    WRITELN(' Current Variable List ');
    WHILE item<>NIL DO
      begin
      WRITE(item@.Vname,' =  ');
      PRTMATH(item@.value);
      item := item@.nextVar;
      end;
  end;
        { }
function ASSIGNMENT(VAR S:string) : boolean;
  begin
    if FIND(BLDSTR('='),S)>0 then
      ASSIGNMENT := TRUE
    else
      ASSIGNMENT := FALSE;
  end;
        { }
procedure State_Error;
  begin
  WRITELN('Invalid assignment Statement');
  BooBoo := TRUE;
end;
        { }
function GETVALUE(S : string) : real;
  VAR
    ptr : V_ptr;
    temp : string;
  begin
    P := FIND(BLDSTR('='),S)+1;
    if P<=LEN(S) then
      begin
      temp := RIGHT$(S,P);
      if NOT(BooBoo) then
        GETVALUE := EVAL(temp, BOOBOO, first, names);
      end
    else
      begin
      State_Error;
      ESCAPE;
      end;
  end;
        { }
procedure GETNAME(S : string; first : V_ptr);
  VAR
    ptr,ptrl  : V_ptr;
    name : Valfa;
    newvar : boolean;
  begin
   p := FIND(BLDSTR('='),S);
   if p>1 then
      GetSTR(LEFT$(s,p-1),name)
   else
      begin
      State_Error;
      ESCAPE;
      end;
   { check to see if new name }
   ptr := first;
   newvar := TRUE;
   WHILE name <> ptr@.Vname AND ptr@.nextVar<>NIL DO
     ptr := ptr@.nextVar;
   if name = ptr@.Vname then newvar := FALSE;
  if newvar then
    begin
    new(ptrl);
```

Listing continued

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Listing continued

```
   ptr@.nextVar := ptr1;
   ptr1@.Vname := name;
   ptr1@.nextVar := NIL;
   ptr := ptr1;
   end;
result := GetValue(Statement);
if NOT(BooBoo) then
  ptr@.Value := result
else   { remove new variable }
  if newvar then
    begin
    ptr := first;
    WHILE ptr@.nextVar<>NIL DO
      begin
      ptr1 := ptr;
      ptr := ptr@.nextvar;
      end;
    ptr1@.nextVar := NIL;
    dispose(ptr);
    end;
end;      { end GetName }
                {   }
```

```
begin { main program }
  initializeNames;
  result := 0;
  new(first);
  first@.Vname := '##ANS    ';
  first@.value := 0.0;
  new(ptr);
  first@.nextVar := ptr;
  ptr@.Vname := '##PI     ';
  ptr@.value := 3.14159265;
  new(ptr1);
  ptr@.nextVar := ptr1;
  ptr1@.Vname := '##E      ';
  ptr1@.value := 2.7182818284;
  ptr1@.nextVar := NIL;
  help;
  REPEAT
    BooBoo := FALSE;
    WRITE('>');
    READLN(STATEMENT);
    if DONE then GOTO 100;
```

```
    if LIST(statement) then ListVars(first)
    else
      if find(bldstr(':'),statement)>0 then help
    else
      begin
      if ASSIGNMENT(STATEMENT) then
        GetName(Statement,first)
      else
        result:= GETVALUE(statement);
      if NOT BooBoo then
        begin
        PRTMATH(result);
        first@.value := Result;
        end;
      end;
100:
 UNTIL DONE;
end.
```

End

Tidbit #16

Daniel Burstiner
Bridgewater, NJ

Thanks to your articles on bar coding (November 1983, October 1984), I've developed some useful applications for the 2 of 5 code listed here.

This program lets you print 2 of 5 bar codes, either sequentially or singly, using the Model 100 and the DMP 2100 or Toshiba 1350 printer.

```
5 REM
10 REM
15 REM
20 REM
25 REM
30 REM
35 REM
100 CLS:CLEAR1000:DEFSTR B,L,N,S:GOSUB1000
105 PRINT"If  single #'s are  desired,
    do not  input a stop #."
110     INPUT"Enter    start    #(>=0:";R:E=0:
        INPUT"Enter stop #."
120   IFR<DORR>999990RE<DORE>99999THENPRINT"
      Try  again stupid!!":GOTO105
125 IFE<RTHENRT=-1ELSERT=1
126 IFE=3.14159THENE=R
200 FORA=RTOESTEPRT
205 NU=STR$(A):Q=LEN(NU):RIGHT$(NU,Q-1)
210 TL=LEN(NU):IFTL<5THENNU="0";NU:ELSEGO220
215 GOTO210P
220 BC=B+S+B+S:REM START BIT
225   FORK=1TO5:T=VAL(MID$(NU,K,1)):BC=BC+L(T):
      NEXT:BC=BC+BW+S+B:REM STOP BIT
320 LPRINCHR$(18);:LPRINBC:BC="":
    LPRINTCHR$(30);"";NU:LPRINTCHR$
    (18):NEXT:LPRINTCHR$(30)
400 IFE=RGOTO195ELSEEND
1000 B=CHR$(255):S=CHR$(128)
1005 BW=B+B
1010 L(0)=B+S+B+S+BW+S+BW+S+B+S
1020 L(1)=BW+S+B+S+B+S+B+S+BW+S
1025 L(2)=B+S+BW+S+B+S+B+S+BW+S
1030 L(3)=BW+S+BW+S+B+S+B+S+B+S
1035 L(4)=B+S+B+S+BW+S+B+S+BW+S
1040 L(5)=BW+S+B+S+BW+S+B+S+B+S
1045 L(6)=B+S+BW+S+BW+S+B+S+B+S
1050 L(7)=B+S+B+S+B+S+BW+S;BW+S
1055 L(8)=BW+S+B+S+B+S+BW+S+B+S
1060 L(9)=B+S+BW+S+B+S+BW+S+B+S
1065 RETURN
```

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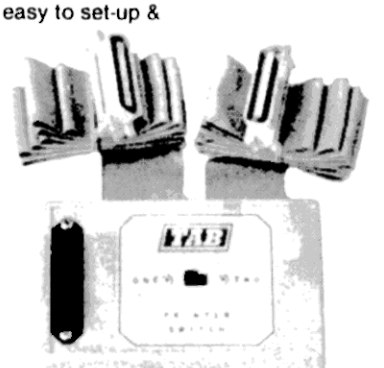

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Function Key Feats On the Model 4

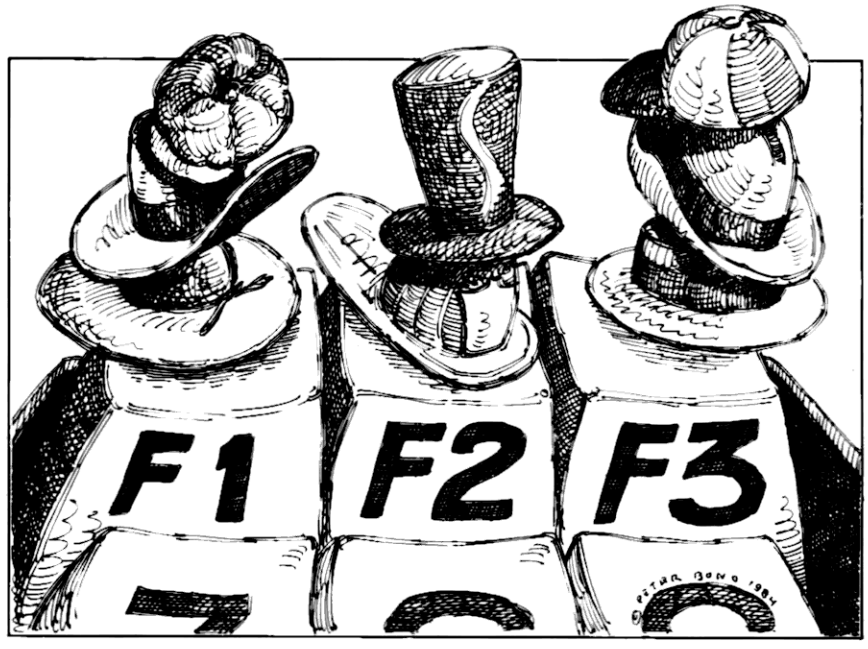

Illustration by Peter Bono

Last month, I presented a program that changes the values returned by the Model 4's function keys. If you want to permanently apply one set of characters to the function keys, that program is sufficient. But the function keys are much more valuable if you can reassign them at will. This month's program shows how, and at the same time demonstrates several more TRSDOS 6.X supervisory calls (SVCs).

Program Listing 1 (Setkeys) fulfills two functions. First if you merely want to see the current function key values, type, from TRSDOS Ready, SETFKEYS. Second, if you want to change the function key values, use the optional parameter and type SETFKEYS (Q). The screen displays the value of each key and prompts you for a new value.

As with last month's program (Three Keys), this month's runs under the EDAS assembler. You may have to make minor variations in the source code to use another assembler. Also, I have again used a simple macro instruction, SVC.

How the Programs Work

When TRSDOS runs any program, it (along with most Model I/III DOSes) enters the program with the HL register pointing to the first nonspace character after the program name in the DOS command line. In Setkeys, HL points to the parameter, if any, that you enter when you call Setkeys from DOS.

Line 600 of Setkeys saves the contents of the HL register on the stack, and the @GTMOD SVC finds the memory location of Three Keys. If it finds the module, DE points to the first byte of the module name. If it doesn't find the module, the Zero flag is reset, and Setkeys ends with an error statement.

Assuming that Three Keys is installed in high memory, Setkeys moves onto line 690, where it uses the @PARAM SVC to parse the possible Query parameter. The @PARAM SVC is extremely powerful, but takes some care to set up. Before it is called, the DE register must be pointing to a special data structure called a parameter table (PARTBL$ in the program at line 1910). The first byte of the parameter table must be 80 hex, the last byte must be a zero.

In between, several bytes must represent each possible parameter. The first is a bit record of the type of response expected (numeric, flag, string, abbreviation) along with the length of the parameter name. The parameter name follows that byte. Then comes a response byte that @PARAM uses to show what type of response (if any) you made. Finally, there must be a 2-byte pointer to the address where the parameter response is to be stored.

In Setkeys, you want the response to be loaded into the BC register at line 820, so the pointer is set to PARM + 1. After the SVC to @PARAM, the program goes through a series of error checks (lines 730–810). If @PARAM returns with the Z flag reset, you've made a gross parameter error (such as an attempt to set an undefined parameter). If you make no parameter response, then the response byte still contains a zero; if bit 6 of the response byte is not set, the parameter specified was not a YES/NO, ON/OFF flag. In all three cases, the program reports a parameter error and ends.

If you specify a legal parameter, the program places it at PARM + 1. The result of a flag parameter is either zero, meaning NO/OFF, or 0FFFF

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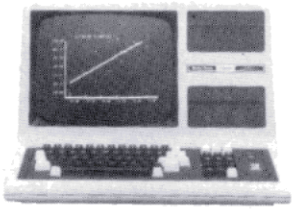

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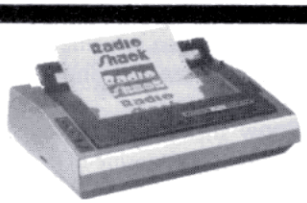

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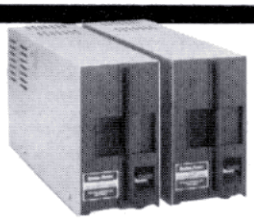

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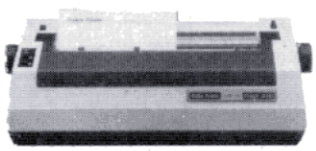

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Program Listing. Setkeys.

```
                00100 ;       *********************************
                00110 ;       *   Function Key Reset Program  *
                00120 ;       *                               *
                00130 ;       *   Written by Hardin Brothers  *
                00140 ;       *********************************
                00150 ;
                00160 ;  This program works in conjunction with FKEY/FLT
                00170 ;   to allow changing F-Key definitions while that
                00180 ;   filter is installed.
                00190 ;
                00200 ;  Assemble as SETFKEYS/CMD
                00210 ;
                00220 ;   Allowable parameter:
                00230 ;
                00240 ;   QUERY= YES or NO
                00250 ;    (QUERY may be abbreviated to Q)
                00260 ;
                00270 ;   If Q=OFF, then current F-Key values are displayed
                00280 ;   IF Q=ON, the F-key values are displayed and user
                00290 ;     is prompted to enter new values.
                00300 ;
                00310 ;*****
                00320 ;       Equates Table:
                00330 ;*****
000A            00340 LF      EQU     10      ;Line Feed character
000D            00350 CR      EQU     13      ;Carriage return
0003            00360 ETX     EQU     03      ;Used to mark msg end
                00370 ;
0002            00380 @DSP    EQU     02      ;Display single character
0009            00390 @KEYIN  EQU     09      ;Accept a line of input
000A            00400 @DSPLY  EQU     10      ;Display a message line
0011            00410 @PARAM  EQU     17      ;Parse a parameter string
0016            00420 @EXIT   EQU     22      ;Return to TRSDOS
0053            00430 @GTMOD  EQU     83      ;Find memory module address
0060            00440 @DECHEX EQU     96      ;Convert decimal ASCII to binary
0061            00450 @HEXDEC EQU     97      ;Convert binary to decimal ASCII
                00460 ;
                00470 ;*****
                00480 ;       Macro Instruction:
                00490 ;*****
0000            00500 SVC     MACRO   #NUMBER
0000            00510         LD      A,#NUMBER       ;Get SVC number
0000            00520         RST     28H             ;Execute SVC
0000            00530         ENDM
                00540 ;
                00550 ;*****
                00560 ;       Initialization Routine
                00570 ;*****
                00580 ;
3000            00590         ORG     3000H
3000 E5         00600 BEGIN   PUSH    HL              ;Save pntr to command line
3001 11BE30     00610         LD      DE,MODNAM       ;DE==>Module name
3004            00620         SVC     @GTMOD          ;Find FKEY in memory
3007 280C       00630         JR      Z,PARAM         ;Go if module found
3009 21C330     00640         LD      HL,NOFKEY       ;HL==> Message
300C            00650 ERRXIT  SVC     @DSPLY          ;Display it
300F 210000     00660         LD      HL,0            ;No system error
3012            00670         SVC     @EXIT           ;Return to TRSDOS
                00680 ;
3015 E1         00690 PARAM   POP     HL              ;HL==>Poss. param string
3016 D5         00700         PUSH    DE              ;Save Filter address
3017 111F31     00710         LD      DE,PARTBL$      ;DE ==> Parameter table
301A            00720         SVC     @PARAM          ;Parse the parameter
301D 2805       00730         JR      Z,PARSE         ;Go if no error
301F 21E330     00740 PERROR  LD      HL,PARMER       ;HL==>Parameter message
3022 18E8       00750         JR      ERRXIT          ;Display and leave
                00760 ;
3024 3A2631     00770 PARSE   LD      A,(RESP)        ;Get response byte
3027 B7         00780         OR      A               ;Was there a response?
3028 2804       00790         JR      Z,PARM          ;  Go if not
302A CB77       00800         BIT     6,A             ;Was it a flag response?
302C 28F1       00810         JR      Z,PERROR        ;Parameter error if not
302E 010000     00820 PARM    LD      BC,0            ;Parameter in BC
3031 D1         00830         POP     DE              ;Recover filter address
3032 210400     00840         LD      HL,4            ;Offset from name to data
3035 19         00850         ADD     HL,DE           ;HL ==> start of data
3036 E5         00860         PUSH    HL              ;Transfer pointer to
3037 DDE1       00870         POP     IX              ;  IX register
3039 21F530     00880         LD      HL,KEYNAM       ;HL ==> F key names
303C 0606       00890         LD      B,6             ;6 times through loop
303E 79         00900         LD      A,C             ;A = flag
303F B7         00910         OR      A               ;Is it 0 (OFF)
3040 200F       00920         JR      NZ,PROMPT       ;Go if Q=ON
                00930 ;*****
                00940 ;       Here to show current settings only
                00950 ;*****
3042 C5         00960 SHOW    PUSH    BC              ;Save loop counter
3043 CD8230     00970         CALL    DISPLAY         ;Show next key & value
3046 0E0D       00980         LD      C,CR            ;Carriage return for next
3048            00990         SVC     @DSP            ;Move cursor to next line
304B C1         01000         POP     BC              ;Recover counter
304C 10F4       01010         DJNZ    SHOW            ;Loop until done
304E            01020         SVC     @EXIT           ;And leave
                01030 ;*****
                01040 ;       Here to show current settings
                01050 ;       and prompt for changes
                01060 ;*****
3051 C5         01070 PROMPT  PUSH    BC              ;Save loop counter
3052 CD8230     01080         CALL    DISPLAY         ;Show next key & value
3055 0E3F       01090         LD      C,'?'           ;'?' for prompt
3057            01100         SVC     @DSP            ;Show it
```

Listing continued

The Display routine makes extensive use of SVC's to show the values assigned to the six function keys.

hex, which indicates YES/ON. The program, after setting the correct values in the IX, HL, and B registers, uses the parameter value to determine whether to use the Show or Prompt routine.

Show merely makes repeated calls to the Display routine in order to show the current values of the six function keys. Prompt does the same, but also lets you enter new possible values. The Prompt routine uses the @KEYIN SVC to get a response from the user and then the @DECHEX SVC to change a decimal response into a single binary byte. Whether a new value is entered as a single quoted character (for example, "A") or the decimal value of such a value (65), that new value is placed in the data area of Three Keys. If you just press the enter key instead of entering a value, the function key is left unchanged.

The Display routine (starting at line 1460) makes extensive use of the SVCs @DSP, @DSPLY, and @HEXDEC to show the value assigned to each of the six function keys as both a character and a decimal ASCII value. It finds the name of each key from the KEYNAM table in the program (line 1820) and the value of that key from the data table at the beginning of Three Keys. It uses only one piece of tricky coding at line 1580.

Normally, the @HEXDEC SVC takes a binary value in the HL register and returns its 5-byte ASCII/decimal representation in a special receiving buffer, followed by a carriage return character. Since this program doesn't want to print that carriage return, it immediately substitutes an ETX character (03 hex) for the carriage return. Then it skips the first two spaces that must be at the beginning of the ASCII buffer before displaying the result.

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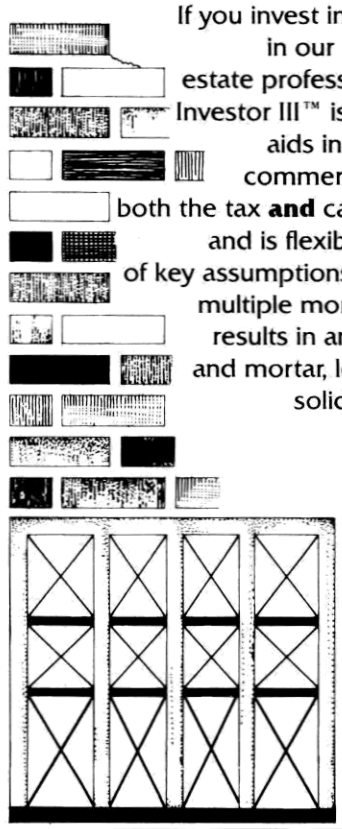

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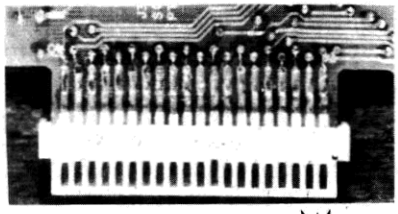

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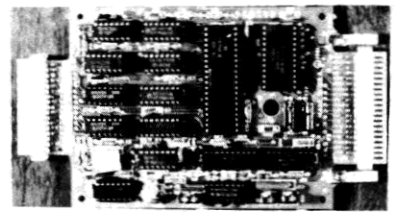

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305B 0603     01120          LD      B,3             ;Prepare to get max.
305D 0E00     01130          LD      C,0             ;  of 3-char. input
305F 212A31   01140          LD      HL,INBUF        ;  stored in INBUF
3062          01150          SVC     @KEYIN          ;Get response
3065 3814     01160          JR      C,PRMPT3        ;Go if <BREAK>
3067 78       01170          LD      A,B             ;Get length of response
3068 B7       01180          OR      A               ;Set flags
3069 2810     01190          JR      Z,PRMPT3        ;Go if <ENTER> only
306B 7E       01200          LD      A,(HL)          ;1st character in A
306C FE22     01210          CP      '"'             ;Was it a string?
306E 2004     01220          JR      NZ,PRMPT1       ;Go if not
              01230 ;*****
              01240 ;        Process string response
              01250 ;*****
3070 23       01260          INC     HL              ;HL==>character after '"'
3071 7E       01270          LD      A,(HL)          ;Character in A
3072 1804     01280          JR      PRMPT2          ;Go save response
              01290 ;*****
              01300 ;        Here if numeric (decimal) response
              01310 ;*****
3074          01320 PRMPT1   SVC     @DECHEX         ;Change to binary
3077 79       01330          LD      A,C             ;Get LSB of result
              01340 ;
3078 DD77FF   01350 PRMPT2   LD      (IX-1),A        ;Save in filter module
307B E1       01360 PRMPT3   POP     HL              ;Recover msg pointer
307C C1       01370          POP     BC              ;Recover counter
307D 10D2     01380          DJNZ    PROMPT          ;Loop until done
307F          01390          SVC     @EXIT           ;Return to TRSDOS
              01400 ;
              01410 ;*****
              01420 ;        Display routine -- Displays key name
              01430 ;          and current key value as both character
              01440 ;          and ASCII. Then updates HL & IX pointers
              01450 ;*****
3082          01460 DISPLAY  SVC     @DSPLY          ;Display current key name
3085 E5       01470          PUSH    HL              ;And save pointer
3086 DD4E00   01480          LD      C,(IX)          ;Get current value
3089          01490          SVC     @DSP            ;Display it as char.
308C 0E20     01500          LD      C,' '
308E          01510          SVC     @DSP            ;Display a space
3091 0E28     01520          LD      C,'('
3093          01530          SVC     @DSP            ;Display parenthesis
3096 DD6E00   01540          LD      L,(IX)          ;Get current key value
3099 2600     01550          LD      H,0             ;  in HL
309B 112E31   01560          LD      DE,ASCBUF       ;DE==>receiving buffer
309E          01570          SVC     @HEXDEC         ;Change to decimal value
30A1 3E03     01580          LD      A,ETX           ;replace cr with etx
30A3 12       01590          LD      (DE),A          ;  at end of number
30A4 212E31   01600          LD      HL,ASCBUF       ;HL==>receiving buffer
30A7 23       01610          INC     HL              ;Bump past two
30A8 23       01620          INC     HL              ;  ASCII spaces
```

Listing continued

Using the Programs

After you experiment with Three Keys and Setkeys for a while, you should feel quite at home with them. The real question then becomes how you can best use them.

If you're using a program that defines the function keys for itself, be sure the FKEY filter is not installed. If it is, and if the function key values are anything other than the standard defaults, the program will probably never see the function keys and will appear to be working incorrectly.

I've found that Three Keys is most useful when I'm writing a Basic program. I define one key as the exponentiation sign (CHR$(94)), because I can never remember that on the Model 4 this sign is defined as the clear and ; keys. I'm also likely to assign one key the value for an underline (CHR$(95)).

More important, by combining Three Keys with TRSDOS's keystroke multiplier (KSM), you can generate simple, one-key entry of such common commands as Edit, List, and Run. Of course, you can use the KSM without the function keys, but I find it more convenient to combine the two.

To see the process in action, use the following series of commands to install the F1 key as Edit, the F2 key as List, and the F3 key as the exponentiation sign (these commands don't change the values of the shifted function keys). These commands assume that you begin with the keyboard driver (*KI) unchanged and that you're working from the TRSDOS Ready level.

*First build a KSM file by typing the command BUILD FK/KSM:0 and pressing the enter key. Then, answer the system prompts as follows:

A=>EDIT press the space key and then the enter key.
B=>LIST press the space key and then the enter key.
C=><BREAK>

*Now that the KSM list is built, you need to install both filters.

SET *FK TO FKEY/FLT
SET *KS TO KSM/FLT USING FK

*Use Setkeys to set the values in Three Keys by typing SETFKEYS (Q) at TRSDOS Ready and answering the prompts as shown in the Fig.

*Finally, you must link Three Keys and the KSM filter to the keyboard driver. The order of these next operations is extremely important.

FILTER *KI USING *KS (install KSM)
FILTER *KS USING *FK (install FKEY)

If all has gone well, the function keys should return the appropriate values. Also, the DEVICE (B) command should show the following routings (assuming that you had nothing else stored in protected high memory).

*KI <# [*KS] X'FF31'
*FK <= X'08F0'
*KS <#> [*FK] X'FFBB'

After you're sure you've installed everything correctly, you can save the results with SYSGEN if you want the function keys configured this way everytime you reboot. Whenever you wish to run an applications program that also uses the function keys, you can disconnect the entire filter chain with the command RESET *KI. Though the two filters will still occupy space in high memory (they only take about 200 bytes together), they will no longer interfere with any program that expects the function keys to have their default values. ■

Readers who subscribe to CompuServe can take part in discussions of topics covered in The Next Step. GO PCS-117 to the Software and Authors Special Interest Group (SASIG), and leave your questions addressed to Hardin Brothers. Feel free to join in conversations started by others.

You can also write to Hardin Brothers at 280 N. Campus Ave., Upland, CA 91786. Enclose a stamped, self-addressed envelope for a reply.

F1 = (129) ? 193 (the value of the clear and A keys)
F2 = (130) ? 194 (the value of the clear and B keys)
F3 = (131) ? 94 (exponentiation sign)
SF1 = (145) ? press the enter key
SF2 = (146) ? press the enter key
SF3 = (147) ? press the enter key

Figure. Here's how you must answer the prompts generated by typing SETFKEYS (Q) at TRSDOS Ready.

THE NEXT STEP

Listing continued

```
30A9            01630           SVC     @DSPLY          ;Put it on screen
30AC 0E29       01640           LD      C,')'           ;Closing parenthesis
30AE            01650           SVC     @DSP
30B1 0E20       01660           LD      C,' '           ;And space
30B3            01670           SVC     @DSP
30B6 E1         01680           POP     HL              ;Recover pointer
30B7 110700     01690           LD      DE,7            ;Offset to next key name
30BA 19         01700           ADD     HL,DE           ;HL==> next name
30BB DD23       01710           INC     IX              ;IX==> next data entry
30BD C9         01720           RET
                01730 ;*****
                01740 ;         Messages
                01750 ;*****
30BE 46         01760 MODNAM    DB      'FKEY',CR       ;Name of FKEY Filter
                01770 ;
30C3 0A         01780 NOFKEY    DB      LF,'Function Key Filter not found!',CR
                01790 ;
30E3 0A         01800 PARMER    DB      LF,'Parameter Error!',CR
                01810 ;
30F5 20         01820 KEYNAM    DB      ' F1 = ',ETX
30FC 20         01830           DB      ' F2 = ',ETX
3103 20         01840           DB      ' F3 = ',ETX
310A 53         01850           DB      'SF1 = ',ETX
3111 53         01860           DB      'SF2 = ',ETX
3118 53         01870           DB      'SF3 = ',ETX
                01880 ;*****
                01890 ;         Parameter Table
                01900 ;*****
311F 80         01910 PARTBL$   DB      80H             ;Mark start of table
3120 55         01920           DB      50H+5           ;Accept flag, abbreviation
                01930                                   ;and 5-character name
3121 51         01940           DB      'QUERY'         ;Parameter name
3126 00         01950 RESP      DB      0               ;Response byte
3127 2F30       01960           DW      PARM+1          ;==>storage area
3129 00         01970           DB      0               ;Mark end of table
                01980 ;*****
                01990 ;         Storage buffers
                02000 ;*****
0004            02010 INBUF     DS      4               ;Input 3 or less chars.
                02020 ;
0005            02030 ASCBUF    DS      5               ;space for @HEXDEC store
3133 0D         02040           DB      CR              ;mark end with cr
                02050 ;
3000            02060           END     BEGIN
00000 Total errors
```

End

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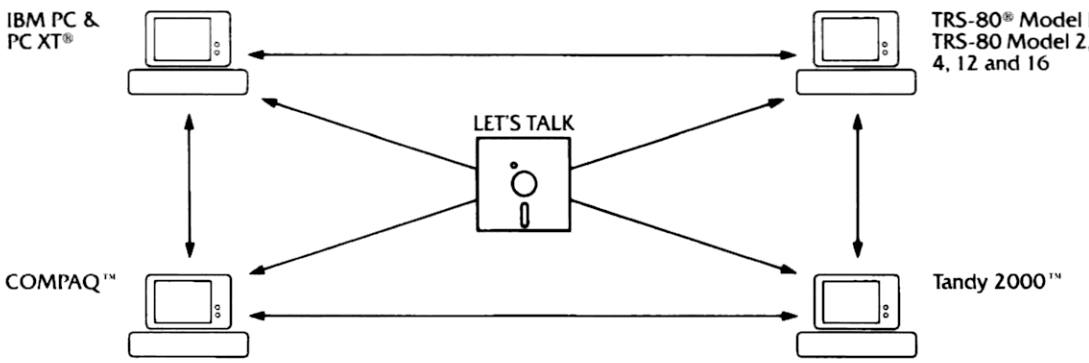

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Getting More Color Into Your Programs

To close out the year I'll discuss two commercial programs for the Model 2000, Lotus 1-2-3 and Convert 2000. I'll also present a short program that lets you use full-screen color with dBase II and other software.

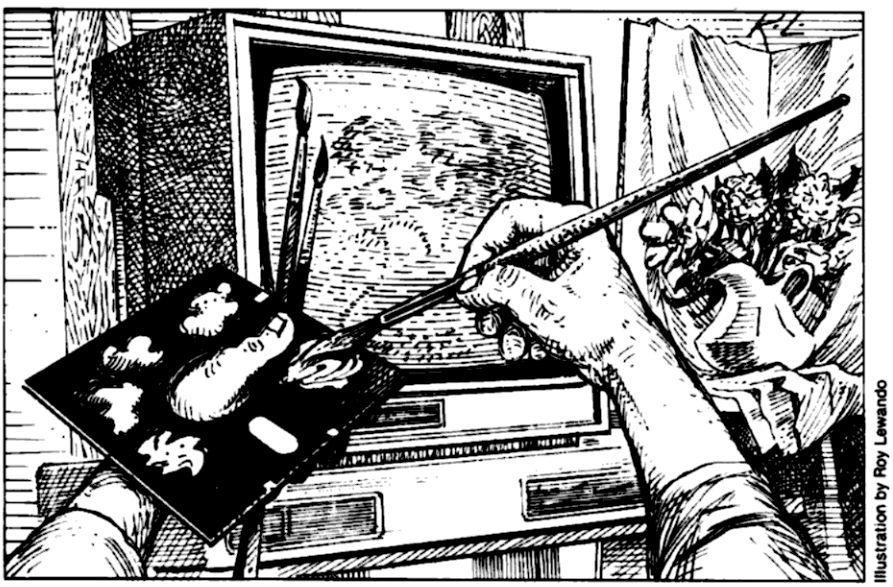

Illustration by Roy Lewando

Basic Conversion Revisited

In my October column, I listed my own routine for converting Model I/III Basic programs to Model 2000 Basic. Convert 2000 (see the Table for product information) does essentially the same thing—it takes a Model I/III program that's been transferred to the 2000 in ASCII format and translates it into Model 2000 Basic. The software comes with a small pamphlet describing its use and listing various traps where the program might not convert code correctly.

Although you can duplicate the distribution disk, the Convert 2000 program is stored in Microsoft Basic's protected format. You can't make any changes to it or even list the program.

I used Convert 2000 to translate a simple Basic program of approximately 100 lines. The conversion took two minutes and 48 seconds on the Model 2000; the converted program was 4,424 bytes long.

I noted some problems. The program converted the statement "Restore" to "Rest or e". It did not change the Clear command to remove the string-space request. It didn't convert several Print @ 0 statements to the corresponding Locate 1,1 statements, and several Print @ statements involving variables or expressions weren't properly identified as errors requiring investigation. Additionally, Convert 2000 ignored any line containing the characters "REM" (e.g., the statement PRINT "REMARKABLE").

Convert 2000 suffers from two major problems: It's slow and it introduces errors into the program by improperly recognizing Basic keywords.

The speed problem is due to the huge amount of string processing required to manipulate the source program in ASCII character format. Requiring the source program to be in ASCII also causes the errors. The Model I/III interpreter does a fine job of token recognition and presents a compact and easy-to-manipulate intermediate program. When you convert the program back to ASCII, you lose all of this information. Convert 2000 must redo all of this work and manipulate the ASCII character strings to recognize the keywords.

Unlike the commercial program, my conversion routine (October 1984, p. 178) uses the compressed, tokenized form of the Basic program created by the Model I/III interpreter. This significantly reduces the program's overhead. On a Model 4P operating under TRSDOS 6.X, my program converted the same 100-line routine in one minute and 51 seconds, almost a minute faster than Convert 2000. The program produced was shorter (4,170

Convert 2000
The Outpost Group
Box 68 Route 631
Marmora, NJ 08223
$49.95

Lotus 1-2-3
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
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bytes) and the conversion introduced no erroneous statements.

The Outpost Group, manufacturer of Convert 2000, is firmly committed to supporting the Model 2000. However, I don't feel that this program is worth its price.

The Protection Game

I don't like protected software—I'd make some changes to Convert 2000 if I could. While software protection may help prevent piracy, it does a great disservice to those of us who are honest.

B.L. Price of Newark, OH, offers a technique for removing protection from Basic software. His method also works if you erase an unsaved program with the New command; it recovers everything but the first line.

To use the procedure with protected software, load the program and type in NEW. Next, type in PRINT CHR$(14) and press the enter key. You'll see a character resembling a double musical note on the screen. Position the cursor over this character; then, using the insert key, insert the program line:

10 PRINT ''

just before the note character. Run the program and immediately type in SAVE "FILENAME", A to save your program in ASCII text format.

The first line will be messed up and will require editing with a text editor. Don't type in anything other than the Save command or you'll lose your program text. Thanks to Mr. Price for his valuable technique.

Program Listing. Colors.COM routine.

```
Use this sequence of commands with Debug to create a machine-language routine
to set the foreground, background, and cursor colors. This routine uses some
low-level Basic Input/Output System (BIOS) calls documented in the Programmer's
Reference Manual (Radio Shack 26-5403) and direct I/O to the color palette
ports documented in the Technical Reference Manual (26-5404).   Parts in
parentheses () are computer prompts; type in what follows exactly as listed.
Each line is terminated with the enter key (identified by <> in the text).
Don't enter the comments that follow these end-of-line markers.

(A>)DEBUG<>Invoke the dynamic debugging monitor

(-)A100<>Begin assembling machine-language commands into address 100H of the
current code segment

(0E56:0100) MOV AH,0<>Function code for set CRT mode

(0E56:0102) MOV AL,8<>Function code for 640 X 400 color graphics

(0E56:0104) INT 10<>Call MSDOS BIOS for video function

(0E56:0106) MOV AH,B<>Function code for set color palette

(0E56:0108) MOV BH,0<>Function code for set background color to the color in
register BL

(0E56:010A) MOV BL,6<>Screen background color to dark yellow

(0E56:010C) INT 10<>Issue video function call

(0E56:010E) MOV AH,B<>Same as above

(0E56:0110) MOV BH,1<>Set default color palette to the number specified in
register BL

(0E56:0112) MOV BL,0<>Select palette 0

(0E56:0114) INT 10<>Issue function call

(0E56:0116) MOV DX,182<>Set port number #1 -- port numbers for the color
palette begin at port 0180H (background) and extends through 018EH for palette
color #7

(0E56:0119) MOV AX,1<>Set foreground color to dark blue; this will be the color
used for text

(0E56:011C) OUT DX,AX<>Output the value in register AX to the port pointed to
by register DX

(0E56:011D) MOV DX,184<>Set port number #2 for inverse video used by dBase-II

(0E56:0120) MOV AX,4<>Set inverse color dark red

(0E56:0123) OUT DX,AX<>Output color to palette

(0E56:0124) MOV DX,18E<>Port address for palette #7 used for cursor color

(0E56:0127) MOV AX,F<>Set cursor white

(0E56:012A) OUT DX,AX<>Output value to port

(0E56:012B) MOV DX,18A<>Port address (palette #5) for character color when the
cursor is positioned over a character

(0E56:012E) MOV AX,0<>Set color black

(0E56:0131) OUT DX,AX<>Output value to port

(0E56:0132) INT 20<>Quit and return to MSDOS

(0E56:0134) <>Exit assembler to DEBUG

(-)RCX<>Change and modify the CX register

(CX 0000) :80<>Set CX to 80 (128 decimal) bytes

(-)NCOLORS.COM<>Set file name for DEBUG

(-)W<>Write file to disk Writing 0080 bytes

(-)Q<>Quit and return to MSDOS
```

End

Showing the Colors

I love my Tandy 2000 color monitor and sometimes spend hours experimenting with the exquisite color combinations available. However, some software doesn't do justice to the monitor. dBase II, for example, doesn't set the entire screen to the background color you specify; you get splotches of various background/foreground color combinations on an overall black background.

How about a nice dark yellow background for the entire screen with letters in dark blue and inverse video in red? The Debug command sequence in the Program Listing establishes these colors until you reset the computer or execute another color sequence. The program sets color palettes 1 and 2 for foreground and background respectively, palette 7 for the cursor color, and palette 5 for the character under the cursor.

All you do to make dBase operate with these colors is run Colors.COM from MS-DOS. Then execute dBase and use the dBase command SET COLOR TO 2,1 to use palette 1 for normal text and palette 2 for highlighted text. This method works well with several other applications and lets you get the most out of your color monitor.

If you'd like a copy of the Colors program, send me a disk in a mailer that has your address and the correct postage on it.

1-2-3 and the 2000

Lotus 1-2-3 has been reviewed many times, so I won't belabor old material.

However, as one of the few integrated software packages available for the Tandy 2000, it merits a brief look.

Integrated software includes many functions bound together within the same shell or main program. Lotus provides a spreadsheet function, data base manager, and business graphics package. 1-2-3 was the first major integrated software package to gain wide acceptance. It's also the only integrated software package that Radio Shack fully supports.

As distributed, 1-2-3 for the Model 2000 comes ready to run. On the 2000, the program is exceptionally fast. I've used 1-2-3 on an IBM PC/XT and find there's no comparison. The higher processor speed of the Model 2000 allows much faster recalculation of spreadsheet data and sorting of data items. This implementation also produces a nice graphics display compared to the lower resolution graphics of the IBM. The machine really makes the difference!

So what don't I like? First, everything you do in 1-2-3 uses the spreadsheet: the data base manager, macro definitions, etc. If you don't have the money to add memory up to the limits of the 2000, you rapidly exhaust 1-2-3's capabilities.

Second, the graphics power is limited. Lotus provides no three-dimensional capability. You can't adjust the colors of the graphs: The program determines colors and shading patterns.

Finally, you can't even inspect the software in the store. The disks are in a sealed envelope to prevent access until after you've read and agreed to the licensing terms. I can't go along with this type of marketing. For $495, I certainly expect to examine what I'm buying before I agree to any terms.

1-2-3 is also a protected system. You can copy the files to a hard disk, but unless the system disk is in drive A, you won't be able to load and execute 1-2-3. I object to protection like this. Open Access, for $100 more, is a more powerful integrated software package and it puts no such limitations on access to the system disks (see the review of Open Access, November 1984, p. 180). ■

Contact John B. Harrell III c/o this column, 80 Micro, 80 Pine St., Peterborough, NH 03458 or via CompuServe at 73016,1326.

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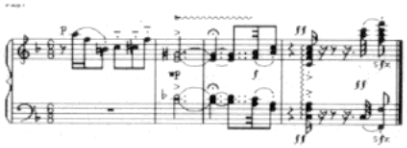

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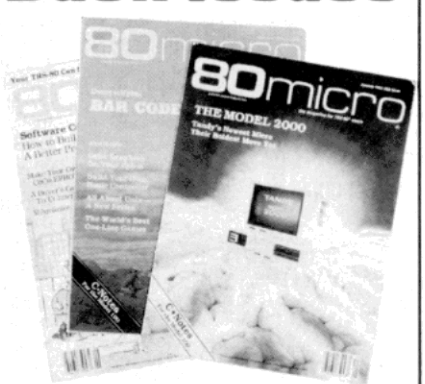

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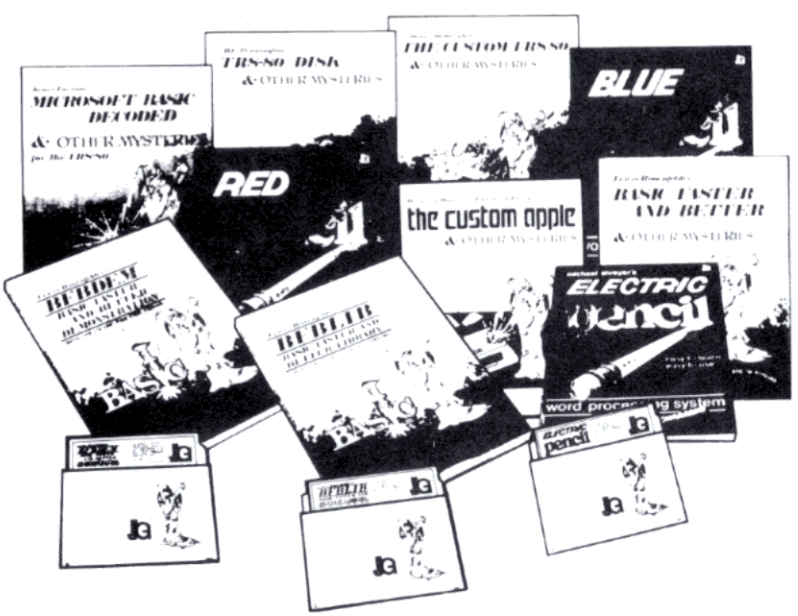

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Continued from p. 40

on a Model 4 can only be described as incredible.

Z has a complete repertoire of commands that are more than adequate for text editing; it lets you specify multiple files on the command line, supports macro execution, locates text by pattern matching, and uses a yank buffer for cut-and-paste operations. However, I preferred the VED editor because it was so easy to use, you could tailor it to suit your needs, and it was faster.

The Compiler System Modules

Once you prepare your source code, you need several system modules to compile it. The first module is the compiler itself. The C80 compiler reads the C source program and generates Assembly-language output.

Compiler command-line options allow specification of an alternate to the compiler's default output file, insertion of C source code statements into the Assembly text as partial documentation (a valuable aid if you intend to hand-modify the resultant Assembly code), definition of selected preprocessor symbols, and manipulation of various table sizes.

The compiler writes 8080 Assembly-language output to the file you specify. You can manipulate the resultant text file with any editor. Unfortunately, the code is in 8080 mnemonics and most Radio Shack assemblers can't accept it.

The assembler accepts a subset of the Microsoft Macro-80 Assembler language and generates relocatable output. Unlike Macro-80, it won't accept Z80 mnemonics or support macro definitions.

The linker is a fully relocatable linkage editor that you use to combine your compiled/assembled program with the other system library routines needed to support execution. The assembler doesn't have to resolve properly defined external references in each assembled routine. This allows modular program development. The linkage editor reads all of these compiled modules and resolves external references. Remaining undefined labels are satisfied from the system library. The result is a core-image file of the linked code.

The linker supports creation of overlay modules for programs too large to fit in memory in one segment. You can also assign beginning addresses to each of the code and data segments of the program.

The linker supports creation of overlay modules for programs too large to fit in memory in one segment.

The final stage of program preparation for execution involves reading the core-image output from the linker and converting it into a disk operating system load module. The CV utility performs this task.

Library Functions

The compiler system would be worthless without a good library of software functions. These provide valuable features like string capabilities, file manipulation, and access to system functions.

The function library is divided into two areas. First are the system functions common to all systems Aztec C80 supports (and also those Unix supports). Second are the system dependent functions unique to a specific system installation.

The function library supports unbuffered input/output (transferring information directly between the system and the device) and standard input/output. These functions are identical to their Unix equivalents and support sequential and random input and output.

Aztec C80 supports the three files opened automatically in a Unix system: STDIN, STDOUT, and STDERR. While you normally associate them with the system console (keyboard and video), you can direct them to any logical device using the redirection feature (altering the normal device assignment by command-line parameters).

These functions are in two libraries: C/LIB and M/LIB. They provide the majority of functions in the system. In addition, ROM/LIB allows the generation of ROM-able code, TINY/LIB permits smaller programs and reduces program overhead, and C3/LIB allows the generation of executable code for the Model III computer in Model 4 mode.

I have one gripe about the library functions: You implement GETCHAR( ) by using a macro definition and the AGETC(stream) function. This is nonstandard Unix and performs the following additional functions: translates the end-of-character(s) into the C newline ('\n'), removes the most significant bit of each character, and translates the end-of-file sequence into an end-of-file condition.

This has a very serious effect. If you take a simple program to copy files from STDIN to STDOUT using I/O redirection, copying normal text files will work fine. Beware of false security, though, because this doesn't work properly on binary files. The function call to AGETC(STDIN) will terminate abruptly whenever it encounters a byte containing X'1A'.

This is a hold-over from CP/M that uses this character (control-Z) as the "soft" end-of-file marker for text files. Normal directory entries do not track the location of the end of file as does TRSDOS, and this mechanism is similar to techniques used with Scripsit and other text processing systems. Fortunately, the function call to GETC(STDIN) has none of these limitations.

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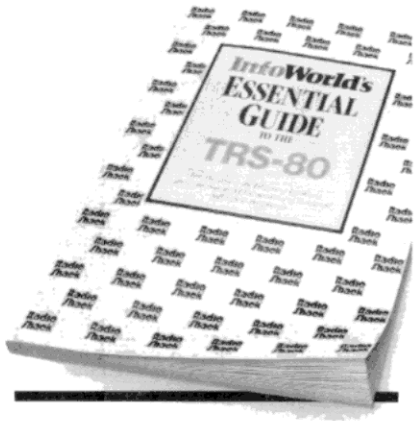

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The Documentation

If you think you'll be able to learn C from the documentation provided, you'll be disappointed. These descriptions pertain only to the direct features and implementation of Manx's compiler. To learn more about C, I highly recommend *The C Programming Language* by Brian W. Kernighan and Dennis M. Ritchie. It's the only acceptable definition of the language standard. For a somewhat easier text, I recommend *Learning to Program in C* by Thomas Plum.

There is one minor annoyance in the documentation. It is written primarily for use with MS-DOS or CP/M. This is evident from the file-naming conventions prevalent throughout the material. While it may only be a minor irritant for the experienced user, a novice may possibly become confused when attempting to use the examples from the book.

Final Comments

This system requires two disks. While it will run from a single disk, I don't recommend it due to the physical size of the software. I built three disks containing the pertinent parts of the compiler and Pro systems. These still contain no operating system. I use the extra 64K of memory as a RAM disk and assign the DOS to the MemDISK. Not only does this speed operation, it allows me to structure the three disks with the routines that I desire. ■

MultiMate: Words To the Wise

by John B. Harrell III

The most important function that the Tandy Model 2000 will initially serve in the business environment is word processing. With its greater speed, memory capacity, and disk storage, this machine has certain advantages over its smaller counterparts. And one of its nicest features is the advanced software available for it.

The first Radio Shack package in this area is MultiMate Professional Word Processing. This software is simple enough to use for short business letters and powerful enough for even the most complex reports.

MultiMate provides an entire operating system for text processing. You never have to exit the program to do such jobs as copy, delete, rename, and edit files. It also contains a print spooler allowing overlapped file printing and editing (or other operations), and you can queue files for printing by time/date in either the foreground or background mode.

What's Inside

Inside, you'll find program documentation, the program disk, and special function-key identification labels. The documentation is logically organized into sections that are conveniently tabbed. A quick flip through the manual shows that key areas of reference are highlighted in color to stand out from the remainder of the text.

Most important, the manual contains a thorough tutorial that includes five separate lessons covering basic operations through the most complex features of the system.

MultiMate has its own utilities to transfer to and from ASCII, recover documents, and edit the printer action and sheet-feeder action tables. These are documented in the second section of the manual.

The reference section is thorough and contains 177 pages documenting

MultiMate Professional Word Processing

★★★★½

Software Systems Inc.
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Easy to use?	★★★★☆
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Does the job?	★★★★★

the numerous features of the system.

The remaining sections of the manual are the appendix, glossary, and index. The appendix provides instructions for properly installing the keyboard labels, troubleshooting problems with your printer, and using the expanded character set with MultiMate and your printer.

The system disk directory provides printer action tables (PAT) for all of the Radio Shack printers and two generic printer action tables. In most cases, one of these two generic PATs will allow you to experiment until you gain sufficient familiarity to install your own favorite printer PAT. It took me a whole five minutes to completely install my Okidata Microline 92 printer.

The special characters in the Tandy 2000 character set that specify special functions are embedded in the text (printer pitch change, etc.). This is a nice deviation from the use of control characters (appearing as ^S) on the screen. On-screen underlining is a nice feature; MultiMate's implementation is particularly good on the Tandy 2000 considering that the hardware-generated underlining runs into the bottom of the characters.

The disk has only 114.6K of free space remaining, because it is an MS-DOS system disk with everything but the Basic interpreter. After removing the nonessential files, I had a respectable 350K, or 140 pages for text storage.

Having worked with other Model 2000 word processing systems, I initially couldn't understand why MultiMate requires 256K of RAM when the others do not. I then noticed that MultiMate responds instantly to requests for help and to commands: the entire system is in the computer's memory. If you have ever used a word processor that requires command and help overlays (WordStar, for example), you quickly learn the benefit of keeping all of the code in memory; systems that use overlays are slowed down by continual disk accesses.

Exploring MultiMate

The opening menu appears in Fig. 4. These nine functions access all pertinent MultiMate features. Several are evident and require no further comment. Others I'll cover when I discuss those particular aspects of the system.

The most frequent uses of the system are selected by the first two options, edit an old document or create a new document. When you create a new document, MultiMate prompts you for a document name, which can be up to 20 alphanumeric characters. The first eight characters must be a valid MS-DOS file name.

The next screen presents the document summary, which you can use to identify the file by operator, author, addressee, key words, and comments. This information is kept with the file while it resides on disk and can be helpful, particularly if more than one person has access to the computer.

You are next given the option to modify some of the document defaults. You can choose widows and orphans, automatic page breaks, decimal tab character, and number of lines per page for each document.

MultiMate's commands are divided into five major categories: cursor positioning (24 commands), editing functions (27 commands), format line control (seven commands), print attribute controls (17 commands), and miscellaneous functions (12 commands). You enter a command by pressing one of the function keys (F1–F12) or the direction keys and other keys surrounding the numeric keypad. Each command uses one of these keys (again see Fig. 4) either unshifted or in conjunction with the shift, control, or ALT keys.

With all of these commands, MultiMate sounds impossible to learn. But the documentation is logically oriented to train you from the easiest commands through the most difficult. And the on-screen help facility is so powerful that you almost don't need the reference manual.

Special Print Effects

If you've ever used a word processor (other than Radio Shack's), you may have experienced the dreaded

1) Edit an old document
2) Create a new document
3) Print document utility
4) Printer control utilities
5) Merge print utility
6) Document handling utility
7) Other utilities
8) Spelling check a document
9) Return to DOS

Figure 4. MultiMate command menu.

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"printer syndrome": "How do I make it print all those neat features in the manual?" This is generally not easy. For example, while WordStar supports many printers, the menu to select special features does not support the newer printer options and there are not enough user-defined options to let you always use all of the features. More important, if your printer is not supported, installation can be very laborious and time consuming.

However, the first thing you'll notice about the MultiMate disk is the total support for Radio Shack's line of printers.

Owners of other printers, don't despair. By using EDITPAT and your printer manual, you are rapidly on your way. EDITPAT requires that you enter the printer commands to correspond to the appropriate MultiMate print editing commands. All you do is fill in the blanks.

In addition, EDITPAT lets you specify a sequence of up to 7 bytes to create a user-defined "token"—a character not normally belonging to the computer's character set. You can redefine any of the characters (except the special characters MultiMate uses) in a translation table.

The Recovery utility tries to correct problems relating to lost data, missing format lines, or other errors.

Other Utilities

The distribution disk also contains a routine similar to EDITPAT for building sheet action tables. EDITSAT uses a similar fill-in-the-blanks technique to quickly and easily define the control codes necessary to operate a multi-bin sheet paper feeder.

FILECONV is another stand-alone utility that converts files to and from the MultiMate format. FILECONV supports conversion of ASCII or DIF (data interchange format used by VisiCalc) files to MultiMate documents. It will also convert MultiMate format files into ASCII text files.

The Recovery utility tries to correct problems in a document relating to lost data, missing format lines, or other errors. These errors are typically caused by removing the data disk while MultiMate has a file open on it.

Conclusion

MultiMate was more powerful than I had anticipated. And yet, it was quick and easy to learn.

The single biggest disappointment is the lack of a spelling checker and editing functions. A disclaimer in the front of the manual stated that the original release did not contain these functions because Radio Shack wanted MultiMate to be released as quickly as possible. The updated version with the full functions will be released as an upgrade and registered owners will be notified by letter. ■

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Disk Doctor

by Mark D. Goodwin

Back-Track is a powerful disk utility that lets you analyze, modify, repair, and copy all single-, double-, and mixed-density 5¼-inch disks. You can also use it with most double-sided and 8-inch disks.

Back-Track is DOS-independent and comes on a self-booting double-density disk. Unlike most other self-booting disks, the system disk isn't protected and you can back it up by following the simple instructions in the manual. In addition, the manual presents full instructions for saving Back-Track as a command file on an LDOS, DOSPLUS, or NEWDOS80 system disk.

The Back-Track System

Back-Track is easy to use. Because it's self-booting, you just put the system disk in drive zero and press the reset button. After displaying a cute little logo screen, Back-Track displays the main menu (see Fig. 5). From the menu, you can select any one of its many operations: reading, writing, copying, and editing disk sectors; reading and writing tracks; duplicating damaged, unprotected, and protected disks; formatting disks; erasing disks; and passing control to an external machine-language monitor.

Back-Track

★★★★

Ridge-Tec, Inc.
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Oak Ridge, TN 37830
Models III and 4, 48K RAM
One Disk Drive

Easy to use?	★★★★☆
Good docs?	★★★☆☆
Bug free?	★★★☆☆
Does the job?	★★★★☆

While all of the features are useful, the most powerful and valuable Back-Track operation is the Duplicate Disk feature. With this, you can copy most disks regardless of density or incorrect CRCs. This makes it possible for you to back up damaged and protected disks.

Documentation and Bugs

Since Back-Track provides help screens for all its operations, the manual seems almost unnecessary, but it's well-written and clearly explains all of Back-Track's many features. The manual isn't condescending to the novice and more advanced programmers will find it informative.

While I was testing the program, I discovered what I consider to be a major bug. Back-Track hangs up indefinitely if you try to access a nonexistent drive or a drive without a disk. And once it does hang up, you have to reboot the system. While this bug doesn't erase any data, it wastes time.

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Frankly, I don't think this should occur.

Conclusions

With its many help screens and ample text, Back-Track scores high in user-friendliness. While novice programmers could find many uses for its duplication feature, the remainder of the features are more suited for advanced programmers knowledgeable about disk structures and operating systems. If your only interest in purchasing Back-Track is to produce legitimate copies of protected disks, you may be better off buying a specific disk utility for that function. However, advanced programmers who like to PEEK and POKE around on disks should seriously consider making Back-Track a part of their program library. It is loaded with features and could be of great assistance in repairing and modifying disks. ■

```
(1) Read Sectors        (7) Read Track        (D) Toggle Density
(2) Go To Monitor       (8) Copy Sectors      (E) Erase Disk
(3) Duplicate Disk      (9) Special Format    (F) Go To DOS
(4) Write Sectors       (A) Analyze Disk      (G) Configure
(5) Format Disk         (B) Toggle Side       (H) Display Buffer
(6) Read Address        (C) Write Track       (Break) Menu
(@) Help.....Press @ and Menu Selection for Help

Density-DDEN      Disk Size-5      Disk Side-0      Printer-PAR

                  Function Desired-?
```

Figure 5. Main menu of Back-Track.

Warriors and Warlocks: Dismal and Dreary

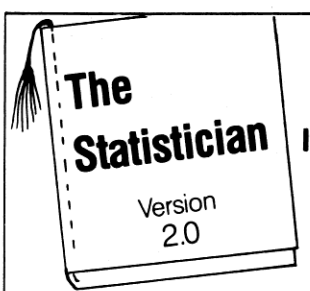
by Thomas L. Quindry

Warriors and Warlocks is a role-playing fantasy game in the mold of Dungeons and Dragons. Like D&D, it has provisions for saving scenarios and characters for extended playing. While intended to keep the avid D&D player occupied for 6–12 months, I doubt that it actually will. It didn't keep the D&D aficionados in my house interested.

Is it challenging? Yes. And that's where the problem lies. It's too challenging to get past the first hurdle, even if you're a practiced D&D player, as were some of the people with whom I played. And if you can't get into the game, why would you want to continue to play? My family certainly didn't.

Game Basics

Warriors and Warlocks has all the makings of a good D&D-type game.



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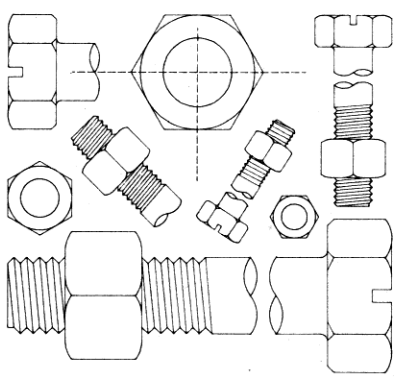

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You can endow characters with a variety of attributes, and you can buy, sell, and trade equipment.

The different areas to explore include the Warrior's Inn, the armory, the village square, the monastery, the castle, and the camp, or you can take a break.

You enter each area to achieve a certain goal. You can band together with other characters to explore the castle to gain experience points and find treasure. At the monastery, you regain your health or resurrect characters who have died. The village square plays host to excursion parties and is a central point for entering the castle or visiting the monastery.

Graphics are limited to the time spent in the castle. A not-so-great spacial picture of the castle is presented that supposedly shows the view while you travel down a hallway, past corridors, or into other rooms. It's easy to get lost in here. Spells are somewhat limited, and you can carry only one at a time.

When you create characters, the program randomly assignsattributes and hit points. You then choose the type of character that best suits the attributes for each profession: fighter, warrior, sorcerer, necromancer, warlock, and so on.

Most characters were killed during the first series of an encounter.

Drawbacks

Although it has all the makings of an interesting game, Warriors and Warlocks fails to deliver.

First of all, it's not easy to learn how to play. If you have had no experience with fantasy adventure games, you may be frustrated just trying to learn it.

Second, you can't proceed far enough to become experienced. Nobody in my house advanced to a point where they could successfully win an encounter. Because the hit point levels you start with are too low, you can't rack up enough experience points to vanquish formidable opponents. Most characters were killed during the first series of an encounter. Considering the time needed to generate a series of characters, this was very discouraging.

Warriors and Warlocks accommodates up to 22 characters. You can delete killed characters and create new ones any time you're at the Warrior's Inn.

Configuring the Game

One of the game's biggest drawbacks is the amount of time needed to configure the program from the distribution disk. This was an adventure game in itself. The program is distributed on two Model I single-density disks. Instructions to configure the program are vague. The documentation comes in three pieces: a rather nice 25-page illustrated booklet explaining game play, a six-page pamphlet, and two cards describing how to transfer the programs.

Warriors and Warlocks supports only Model I TRSDOS and NEWDOS80 2.0 for the Model I/III; TRSDOS for the Model III is not supported. You need three disks for Model I single-density systems and two for double-density. You might as well break out a new box of disks if you're using TRSDOS 2.3—the instructions say that TRSDOS requires three more disks to back up the scenario.

Transferring the programs is unnecessarily difficult. A simple conversion from one disk to another won't work. You need a program on the distribution disk to configure the game disks.

Instructions tell you to purge all files except certain listed system files. You then run a program called ABEDOS/BAS to transfer the game program. As it churns away for an hour or more, don't think, "My computer is doing all the work." Stay nearby because you occasionally have to respond to certain instructions.

Conclusion

Warriors and Warlocks just wasn't much fun. The D&D players in this household didn't enjoy the game, and the beginners found it even more frustrating. Play was slow due to the many disk accesses. And the relatively short life span of the characters made everyone lose interest quickly. Sometimes a discovery period is needed for you to become acquainted with this type of game. But after our experience with it, we gave up. ■

Warriors and Warlocks

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It also includes a TRS-XENIX disk for compatibility with the Radio Shack Model 16 and a serial printer port with a programmable baud rate.

The serial-to-parallel converter lets the DT-100 access parallel printers through the serial printer port. For more information contact Tandy Corp./Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

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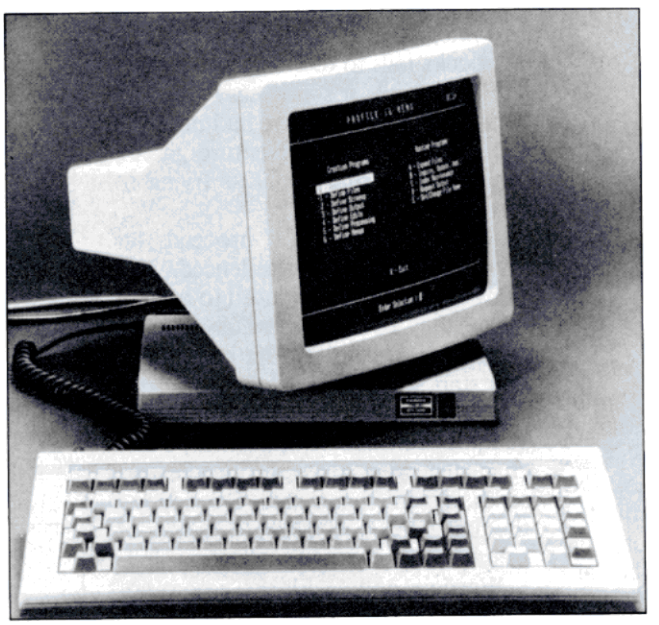

The DT-100 data terminal features a built-in serial port with programmable baud rate.

Finding Software Freebies

Thousands of public domain programs are available free if you know where to look for them. *How to Get Free Software*, by Alfred Glossbrenner ($14.95) tells you where and how to find public domain software for every computer and operating system.

Programs listed include word processors, spreadsheets, communications programs, data base managers, and filing programs. Also listed are music, graphics, and education programs, as well as games, utilities, and a TRS-80 data base program.

How to Get Free Software tells you how to access software libraries of user's groups and bulletin boards, and how to spot good programs from thousands in a software library.

Other subjects include downloading, using the XMODEM file transfer protocol, and converting hex files on CompuServe to programs you can run. The book contains a list of clubs, a glossary, and an index.

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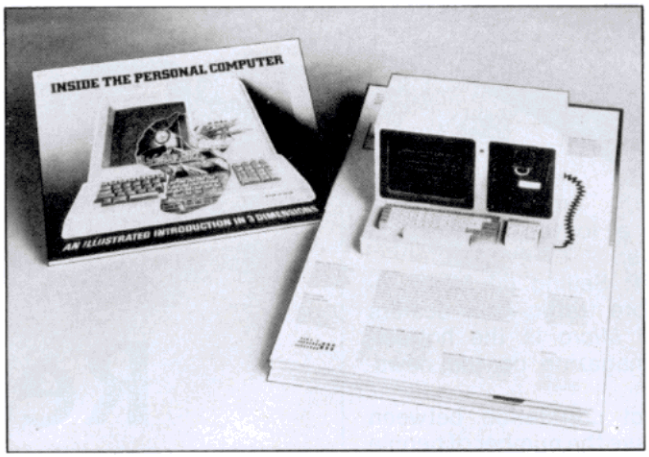

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Inside the Personal Computer is recommended for all ages. It measures 12 by 18 inches, and sells for $19.95. For more details, contact Abbeville Press, 505 Park Ave., New York, NY 10022, 212-888-1969.

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$59 Plus $3.00 Shipping & Handling. California Residents add 6%. To order or for further information write: Walksoft Programming, P.O. Box 1878, Ridgecrest, CA 93555.

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E-C

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GIVETEST administers the tests and writes each student's performance to disk. It contains antitampering features to prevent student cheating.

REVTEST lets you examine and edit test files stored on disk. PRNTTEST reads a selected test file and prints it in 80-column format. READGRAD prints out or displays a file of student scores.

The MAKETEST programs are Network 3 compatible, and each station can load a different test file. Contact Software by Teachers Inc., P.O. Box 8479, Alexandria, LA 71306 for more details.

Reader Service ✓ 553

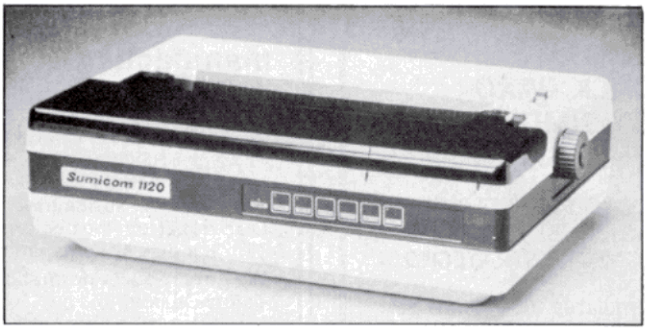
Sports on the Record

The Sports Stats spreadsheet programs for the Models III and 4 ($63) keep records for each player on your basketball or baseball team and provide immediate, up-to-date statistics.

Sports Stats has 20 input categories for basketball and 32 categories for baseball (16 each in pitching and hitting). You can also personalize the program to suit your needs.

The spreadsheet is menu-driven and includes a back-up disk. For more information contact Educational Activities Inc., P.O. Box 392, Freeport, NY 11520, 516-223-4666.

Reader Service ✓ 569



Sumicom's Model 1120 printer gives you letter-quality printing for under $500.

Letter Quality for Under $500

The Sumicom 1120 18 cps daisy-wheel printer ($495) offers letter-quality output, prints at a 60 dB noise level, creates up to four carbon copies, and accepts paper up to 13 inches wide.

It's also lightweight (21.1 lbs.), and features software-selectable bidirectional incremental printing and bidirectional logic-seeking printing.

The unit includes a 120-day warranty and Centronics interface. An RS-232 interface, forms tractor, and cut sheet feeder are also available.

Contact Sumicom Inc. at 17862 E. 17th St., Tustin, CA 92680, 714-730-6061 for more details.

Reader Service ✓ 570

Better Betting

STAT21 is a card-counting strategy simulation/analysis program that deter-

back-track

The Super User Friendly Disk Utility
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- Duplicate Most Protected Disks
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✓ 35

mines the effectiveness of different card-counting strategies.

Enter your strategy and specify the house rules. STAT21 simulates 100 hands per second, up to one billion hands, and stores simulations and analysis data to disk.

Results include total action, total stake, stake/action, high and low stakes, betting analysis, and insurance analysis.

STAT21 requires a Model III or 4 with 48K RAM and two drives. It includes a user's manual and sells for $59 plus $3 shipping from Walksoft Programming, P.O. Box 1878, Ridgecrest, CA 93555.

Reader Service ✓ 564

Byte-Protected

The Byte Guard 5¼-inch disk drive head cleaning disk from Precision Computer Products removes dirt, dust, and oxide deposits from drive read/write heads, preventing disk errors and data losses.

Byte Guard cleaning disks keep drive heads clean without messy fluids.

Byte Guard polishes drive heads as it cleans to reduce scratches from debris and loose oxide particles. It's safe for daily use, and requires no alcohols or fluids.

Each disk is $39.95 and carries a guarantee for 260 cleanings or one year. Eight-, 3½-, and 3¼-inch cleaning disks are also available. Contact Precision Computer Products, 770 Welch Road, Palo Alto, CA 94304, 800-321-2804 for more information.

Reader Service ✓ 568

Conversion Basics

You want to buy a Model 2000 or Model 4, but you've

TRS-80 **TOURNAMENT CHESS** MODEL 4

A NEW GENERATION OF SOFTWARE

Every feature improved!

Sharp, hi-res graphics playing board.

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Opening book contains over 2,000 moves.

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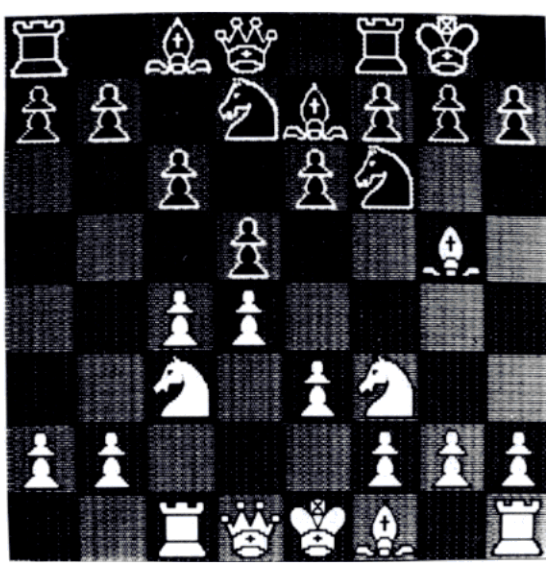
Comes with a complete Instruction Manual.



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Display game history.

Dump hi-res screen to graphics printer.

Swap sides, take back moves, save/retrieve games to disk, and much more.

✓234

Uses Radio Shack Cat. 26-1126 hi-res graphics.

Tournament Chess is also available for TRS-80 Models I, III, 4, 4P in low-res graphics versions.

For more information about Tournament Chess and other full-featured strategy games, write to:

Rapidynamic SOFTWARE, INC.

14358 Dyer Street, Sylmar, California 91342

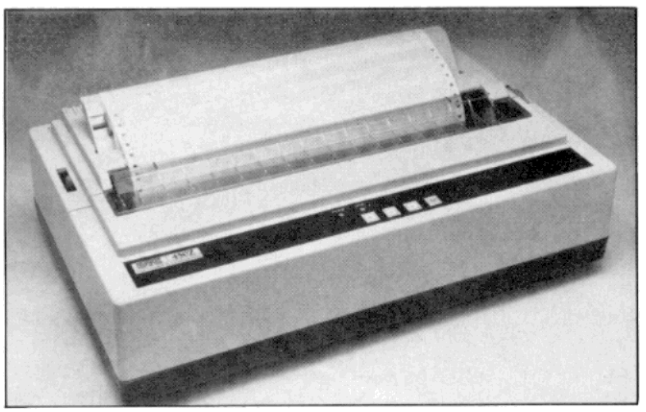
✓ See List of Advertisers on Page 192

already invested heavily in software for your Model III. No problem. Two conversion utilities from Educational Micro Systems Inc. (P.O. Box 471, Chester, NJ 07930, 800-922-0786) convert Model III Basic programs to run on the Model 4 or 2000.

CONV3TO4 ($49.95) and CONV3TO2000 ($139.95) are menu-driven and translate 95 percent of all Basic programs. The utilities automatically insert required spaces between keywords, recalculate PRINT@ addresses, adjust tab addresses and exponentiation symbols, and remove down arrows.

The programs also flag and list unresolved program lines and optionally remove remark statements. Both programs include a disk formatter, file transfer program, and a user's manual (available separately for $5).

Reader Service ✓ 557



The 45 cps DTC 450Z daisy-wheel printer doesn't leave your office in an uproar.

Basic Vivace!

Vivace!, WittSoft's new Basic compiler, turns Model III or 4 Basic programs into command files. Programs compiled with Vivace! run up to twice as fast and are more secure than conventional programs, since you can't list or disassemble them.

The compiler features full error-trapping, compiles any Basic program, and requires no programming knowledge.

The Model III version requires 48K RAM and two drives. It runs under TRSDOS 1.3. The Model 4 version requires 64K RAM with two drives, and runs under TRSDOS 6.X or DOSPLUS IV.

Vivace! sells for $49.95 (plus $5 shipping) from WittSoft, 1302 41st St., Orlando, FL 32809, 305-423-5683.

Reader Service ✓ 558

Integrated Software For the Model 2000

T/Maker Co.'s Integrated Software package for the Model 2000 and Models II, 4, and 4P with CP/M puts a relational data base, word processor, 55,000-word spelling checker, spreadsheet, list processor, and bar-chart graphics program in one package.

"WORKTOOLS 80" — AN INTEGRATED SOFTWARE FOR THE TRS-80™*

"WORKTOOLS 80" is the "Kernel" for a Small Business Software System with 3 fully file compatible programs in an "Integrated Command Environment": "Worksheet 80", a Spreadsheet Program, "Worktext 80", a Word-processor Program and "Workfile 80", a Data Base.

"WORKSHEET 80" Spreadsheets have up to 64 columns and 66 rows with programmable column, row number, individual column width and decimal place number. Any cell, row or column of cells can be defined by formulas including all arithmetical operators or by special functions such as TOTAL, AVERAGE, MAXIMUM, MINIMUM and PERCENT.

"WORKTEXT 80" features fully programmable format, indentation, centering, hyphenation, headers, footers, auto page numbering and printer control. The MERGE Function allows for Form Letters merging with files made by "WORKFILE 80" and the inclusion of "WORKTEXT 80" Spreadsheets into documents.

"WORKFILE 80" features fully programmable record format and size and will work on Lists, Reports, Spreadsheets, or Ledgers, either created by it or by the other Programs in the System. Has powerful "Data Base" commands such as SEARCH and VIEW/UPDATE.

Besides their own Special Functions and Commands all Programs share Powerful System Commands such as: OPEN FORMAT, DELETE, INSERT, COPY, MOVE, FIND/REPLACE, LOAD and SAVE.

The soon to be available "WORKPROOF 80"—a Proof-Reader and Dictionary Program will complement this first Module of the "WORKTOOLS 80" Software System for only $39.99.

NOW AVAILABLE FOR TRS-80 MODELS III, IV, MOD.100 32K DISK AND COCO 32K DISK FOR ONLY $99.99 (California residents add 6.5% tax)! **So send check, money order or VISA/MC/AMX number and expiration date to:**

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✓183

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HANDY HOME COMPUTER FOOTBALL SYSTEM ✓120

USER FRIENDLY - MENU DRIVEN
DESIGNED BY COMPUTER PROFESSIONALS

Evaluate teams at all levels, PEE WEE to NFL. Define the teams, their ratings and schedules. Weekly enter the scores and statistics with no redundancy. Individual items can be corrected.

The main menu follows:

1. **UPDATE TEAMS** (Define names, ratings, Y-T-D Stats)
2. **CREATE/UPDATE SCHEDULES**
3. **STATS ENTRY** (Enter newspaper results)
4. **POST RESULTS** (Update team with results)
5. **FORECAST GAMES** (Predict game scores)
6. **RPT WRITER** (Define and print/display reports)

To save the initial entry of the teams, ratings, statistics, and especially their schedules, also purchase the current data files.

Follow College and NFL football with no data entry; purchase the Evaluation Subscription(s). These Monday mailings include predictions and updated statistics. The latest edition is included with each system to provide up-to-date team data.

For the TRS-80 I/III/IV/100, APPLE II/III, IBM PC, KAYPRO II, and Commodore 64. BASIC listings also available to program other computers. **Specify computer, tape or disk.**

$39.95 for the BASIC system, $61.95 with College data, $57.95 with NFL data, $78.95 with both. Add $3 S&H. Evaluation Subscription: College or NFL is $29.95, both for $39.95.

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HANDY AND ASSOCIATES
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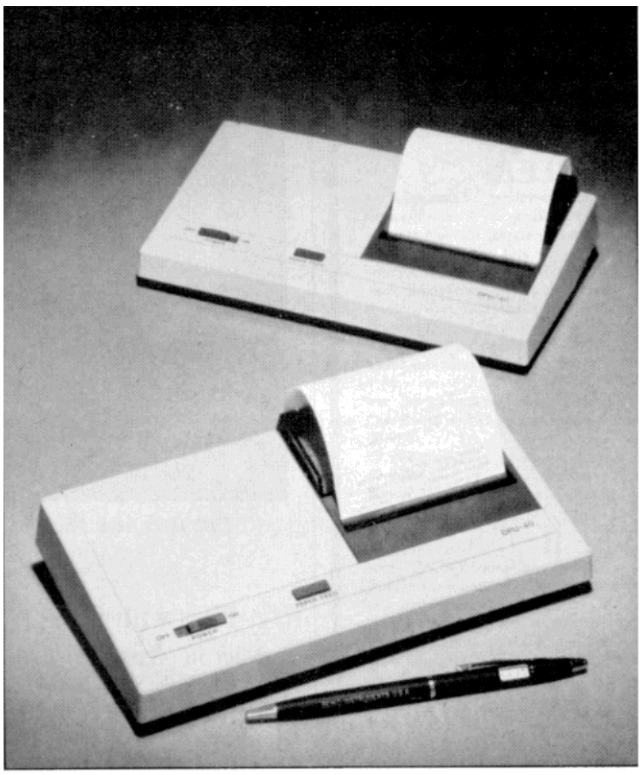
All functions operate from the word processor program—no windowing or mode-shifting is necessary to integrate applications. The word processor features header and footer capability and automatic footnote placement.

The spreadsheet program operates within the word processor to reduce setup time. The data base manager links data bases to generate reports or create a new data base.

The spelling checker works on all files, including spreadsheets and data bases. The package also features an on-line help file. Integrated Software is $450 from T/Maker Co., 2115 Lansing Drive, Mountain View, CA 94043, 415-962-0195.

Reader Service ✓ 565



Seiko's DPU-40 thermal printer sells for $124.95.

Hot Off the Press

The newest printer from Seiko Instruments leaves you with more than just a good impression. The DPU-40 thermal printer ($124.95) is small (8¼ by 4½ inches), lightweight (14 ounces), and prints 40 columns.

It accepts three-inch thermal paper and prints .6 of a page per second in 5 by 7 dot-matrix format.

A built-in character generator converts host computer data into 5 by 7 format and produces the 96-character ASCII set.

The DPU-40 uses a parallel port and an ac adapter power supply. For more information contact Seiko Instruments USA Inc. at 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777.

Reader Service ✓ 551

T80-FS1 Flight Simulator

Available for Model I or Model III. $25.00 on cassette or $33.50 on disk (with enhancements) All versions require 16K.

If you order direct, please specify whether you have Model I or Model III (the media *are* different) and whether you want disk or cassette. Include $1.50 and indicate UPS or first class mail. Illinois residents add 5% sales tax. Visa and Mastercard accepted.

If you don't yet own a disk, don't fret. You can upgrade anytime. Cassette users may send back their cassette (but *not* the manual) along with $10 (first class shipping included) and receive the disk version.

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PROGRAMMING TOOLS FOR YOUR TRS-80™

INSTANT ASSEMBLER

The INSTANT ASSEMBLER is a powerful machine language development system for the TRS-80. One program contains the editor, assembler, and debugger. It allows you to assemble directly to memory and immediately debug your programs with the built-in single stepping debugger. Quickly switch from assembler to debugger and back again without losing the source code. This feature makes INSTANT ASSEMBLER an excellent learning tool for the beginner and a super fast development system for the experienced programmer. INSTANT ASSEMBLER has many other unique features. It detects syntax errors as source is entered and stores its source in a compressed format that uses only 40% as much memory as other assemblers. It is incredibly fast and will assemble 10K of object code in just 8 seconds. It will also create relocatable code modules that can be saved on disk or tape and linked together for very large or modular assemblies. INSTANT ASSEMBLER comes with a comprehensive 65 page instruction manual and is available in several versions for different machines. The CP/M version does not run on all machines so inquire before ordering.

TAPE INTASM 2.1 for Model 1 and 3 ..... **$39.95**
DISK INTASM 2.1 for Model 1 and 3 ..... **$49.95**
DISK INTASM 3.0 for Model 4 ..... **$69.95**
DISK INTASM 3.0 for CP/M **$69.95**

INSIDE LEVEL II

This book is a comprehensive reference guide to the Model 1 and Model 3 ROMs which allows the machine language programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. In addition, the 18 chapters include a large body of other information useful to the programmer. 80 Micro said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

INSIDE LEVEL II **$15.95**

DEMON DEBUGGER

DEMON (for DEbugger and MONitor) is a sophisticated tool with which you can explore and debug machine language programs. The STEP mode has 19 different commands and will step through machine language programs one instruction at a time, showing you the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The MONITOR mode has 26 different commands including a labeling disassembler. DEMON is available on tape or disk and includes a comprehensive 40 page manual with many examples.

DEMON 1.0 for Model 1 and 3 ..... **$39.95**
DEMON 2.0 for Model 4 ..... **$39.95**

DISK INDEX

DISK INDEX will assemble an alphabetized index of every disk in your collection. Simply put each disk in the computer one after another, and DISK INDEX will quickly read the program names and free space left. It will recognize any DOS and disk density (except CP/M) and catalog disks for the Model 1, 3, and 4. The whole index or any selected part may be displayed on the screen or printed on paper in several different formats. Display modes include programs grouped by disk name, by program name, disks in order of decreasing free space, and by program showing the number of backup copies of each one. The index itself may be stored on disk for future access and update. A 48K machine will hold up to 255 disks or over 2000 programs in each file, and you can create as many files as you need. DISK INDEX comes with a comprehensive 28 page instruction manual.

DISK INDEX 3.2 for Model 1, 3, or 4 ..... **$39.95**

TELCOM

Mumford Micro offers two telecommunications programs. **TELCOM I** has most of the features needed to communicate with bulletin boards, time share systems, or for file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. **TELCOM II** is an enhanced version of this program, which also supports the LYNC protocol which will automatically detect and correct errors in transmission. Files can be sent to or fetched from an unattended computer. The instruction manuals for both programs are available separately for $5 to help you decide which program is best suited to your needs.

TELCOM I for Model 1, 3, or 4 ..... **$39.95**
TELCOM II for Model 1 or 3 ..... **$69.95**

MODEL I SPEED UP

The SK-2 is a hardware modification for the Model 1 that allows CPU speeds to be increased by 50% or 100%. Speeds may be changed with a toggle switch (not included) or on software command. It can also be configured to return to normal speed any time a disk is active. It mounts inside the keyboard unit with only 4 necessary connections and is easily removed if the computer ever needs service. The SK-2 has been field proven by 3 years of use, and comes fully assembled with socketed IC's.

SK-2 ..... **$29.95**

ORDERING: Ten day money back guarantee. Include $2.50 for postage and handling. California residents add 6% sales tax. Visa, MasterCard and COD orders accepted. SPECIFY MODEL NUMBER. Dealer inquiries invited.

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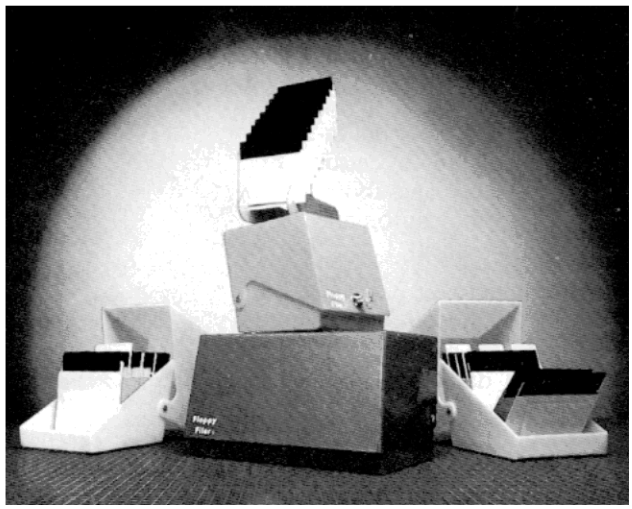
NEW PRODUCTS



Disk filers from Micron Systems are available in nine colors.

Files with Style

Micron Systems Corp. (100 McNab St., Arnprior, Ontario, Canada K7S 2C7, 613-623-7931) offers five colorful ways to store and protect your disks.

Files are constructed of injection-molded antistatic ABS plastic for durability, and are available in royal blue, red, green, orange, ivory, smoke, yellow, brown, and powder blue.

The Floppy Filer ($37.60) holds 60 5¼-inch disks and features a spring-loaded locking cover, molded carrying handle, and three index tabs. A 120-disk Floppy Filer ($61.95) with six index tabs is also available.

The Flex Filer is a desktop filing system constructed of interlocking outer modules with sliding drawer containers. It's available for 5¼-inch disks for $7.95 per module.

The Boomerang disk rack ($12.95) keeps 10 5¼-inch disks ordered on a tiered stand while you're working with data.

Transit Filer is a book-style protective case for shipping or storing up to four disks. It's available for 5¼-inch ($8.95), 8-inch ($9.95), and 3½-inch disks ($14.95).

Page Filer ($1) is an antistatic protective envelope with two pockets for 8-inch disks or four pockets for 5¼-inch disks. Each filer fits into a standard three-ring binder.

Reader Service ✓ 571

Heavy-Duty Daisy Wheel

The Model 450Z bidirectional daisy-wheel printer from Data Terminals & Communications (590 Division St., Campbell, CA 95008, 408-378-1112) is built for continuous use.

It prints 30 word-processing and 28 data-processing type styles at 45 characters per second, yet is quiet enough to let you carry on conversations while it prints at full speed.

Word processing features include automatic underlining, double-strike, shadow printing, subscripts, and superscripts. The printer uses an RS-232 or parallel port and provides out-of-paper and out-of-ribbon signals.

The 450Z is $1,595. Interchangeable print wheels, multistrike film or ribbons, sheet feeders, and a bidirectional forms tractor are also available.

Reader Service ✓ 559

In Armageddon you defeat other players through diplomacy and military action.

The Nuclear Solution?

Continent by continent, the world has succumbed to revolution. As the leader of one continent in a post-revolutionary world, your survival depends on defeating up to five other countries.

Armageddon 1998 is a world politics/nuclear war game that pits you against one to five other players to determine who will be the next world leader.

You start by building up your country's economic and military might. You can form alliances, build hospitals, build antiballistic missile systems and ICBMs, and send secret messages to your allies.

In addition to military strength, you must invest in farming to feed the population and generate propaganda to keep your countrymen from revolting. Eventually, combat or nuclear strikes are necessary to eliminate opponents.

To win you must crush all opponents, keep the economy in good shape, prevent revolution, and gather taxes to pay for defense.

Armageddon 1998 requires a 48K Model I, III, or 4 and is available on disk for $19.95 plus $2 postage. For more information contact Pacific Software, P.O. Box 1295, La Canada, CA 91011, 818-795-2178.

Reader Service ✓ 554

Model 4 TASMON

Got a program that won't run on your Model 4 or 4P? TASMON4, from The Alternate Source (704 North Pennsylvania, Lansing, MI 48906, 517-482-8270), generates Z80 Assembly-language source code that you can edit with any Z80 editor.

This TRSDOS 6.X program examines and modifies memory, executes machine-language programs in real time, single-stepped, or in slow motion, and displays memory in hexadecimal or ASCII format.

You can trace memory at variable speeds or by single-stepping, and the program is relocatable so you can keep it away from programs you're debugging.

TASMON4 also features a View Disk File command that displays program beginning and ending addresses.

The package includes a 50-page user's manual and disk for $29.95. Source code is also available.

Reader Service ✓ 561

70 INCOME TAX PROGRAMS
(For Filing by April 15, 1985)
TRS-80* Models I, II, III, 4, 12 & 16

FEATURES: —

1. *Menu Driven.*
2. *"Save on Disk"*
3. *BASIC, Unlocked, Listable*
4. *Name/SS No./F-S carried over*
5. *Inputs on screen before printing*
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7. *Prints entire Form/Schdule*
8. *Calculates Tax etc.*
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Reader Service ✓ 555

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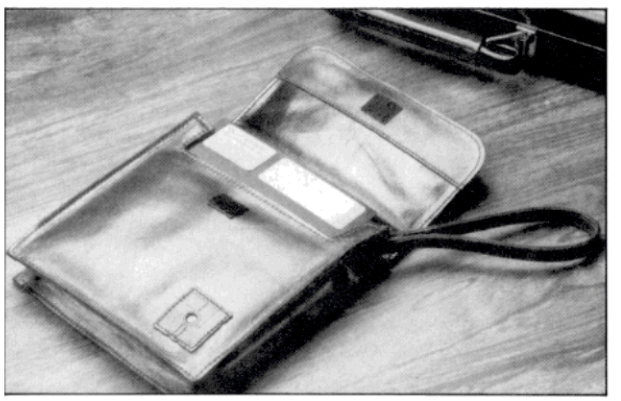

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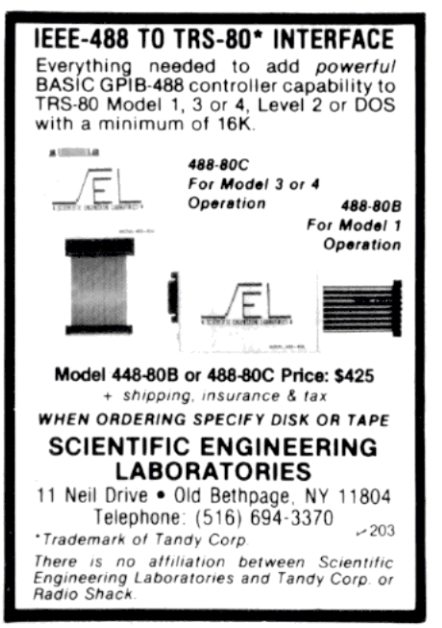

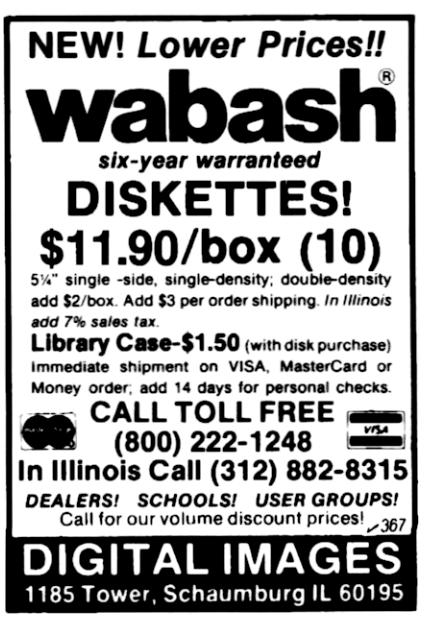

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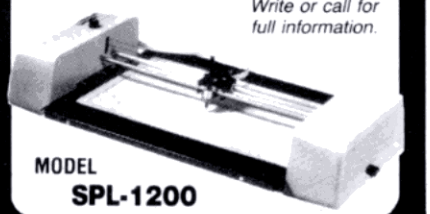

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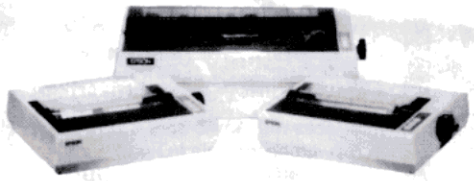

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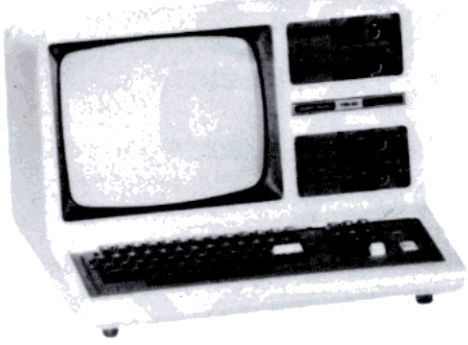

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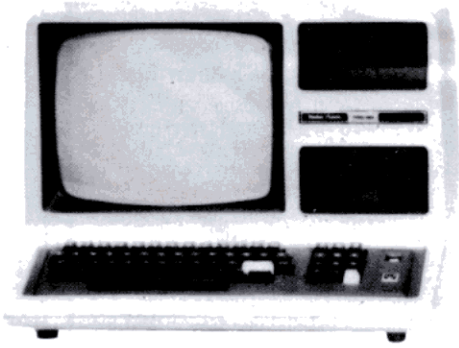

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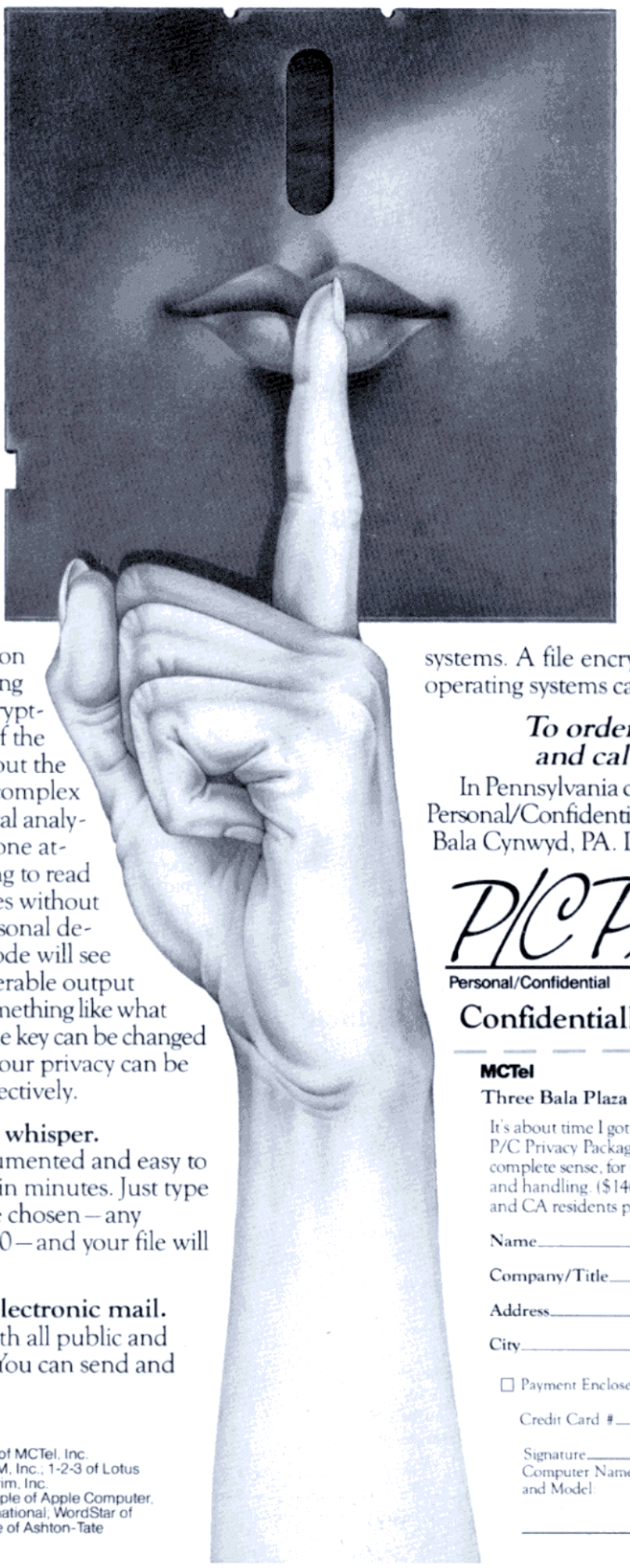

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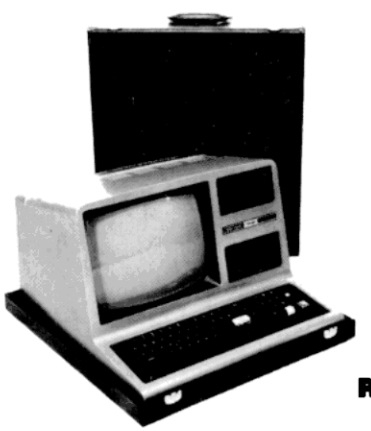

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Bazzell	Taking Stock	9:86		I, III	Organize your stock portfolio
Earp	In the Marketplace	7:82		I, III	Hone your investment skills
Hickenbottom	Account for Yourself	3:187		100	Generate expense account reports
Jansen	Shorter Sorts	5:62		III	Sort VisiCalc files using the data interchange format
Kurtz	Amortified	5:59		III	A spreadsheet template that calculates your loan payments
Marcoulides	Growing Pains	5:64		III	Increase VisiCalc's capacity by storing data in the data interchange format
Ramella	Getting Personal	6:161		100	Prints personalized form letters
Robb	Calling Wall Street	4:178		100	Calling the Dow Jones News/Retrieval Service
Sparks	For Sales	8:142		I, III	Calculates sales commissions and provides a sales history
van Beverhoudt	Time Keeper	10:84		I, II, III, 4, 2000	Organize business projects with a time distribution program
Williams, D.A.	Formula Secret	5:66		III	Save and print only the formula in a VisiCalc file
Williams, A.S.	Screening for Help	5:58		III	Add a Help screen to VisiCalc

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Author	Title	Issue:Page	Debug	Model	Annotation
Balonis	100 Disks	1:171		100	Transfer Model I/III files and add manual disk storage to the Model 100
Balonis	Write Now	2:191		100	A Model 100 word processor
Balonis	Pin Pals	2:194		100	Transfer Basic and text files between two Model 100s
Balonis	A New Pair of Shoes	3:194		100	Craps game for the Model 100
Balonis	Sort Order	7:126		100	Alphabetize your data files
Cadmus	Fast Backwards	3:184		100	Using reverse Polish notation to do math calculations
Carmody	Graphic Results	4:188		100	Graphics for the Model 100
Cornman	A Real Sketch	5:158		100	A sketchpad graphics program
Cornman	Form-matters	6:156		100	Converts Model 100 text files to Model III Scripsit
Cornman	Portable Scripsit	7:124		100	Translates Model III Scripsit tapes to Model 100 format
Deininger	Seven 100 Percent Solutions	2:186		100	Alternative ways to power your Model 100
Dixon	Thanks for the Memory	3:185		100	Install 8K memory chips in your Model 100
Firshein	From Soup to Nuts	5:169		100	A command menu that drives your Model 100 programs
Harlow	Rooting Out the Problem	1:176		100	Plots data and determines the value of roots in equations
Harris	North by Northwest	4:186	9:30	100	Determine the distance between any two locations on earth and get a compass bearing
Hickenbottom	Account for Yourself	3:187		100	Generate expense account reports
Jones	The Great Escape	1:174		100	Explains Model 100 escape codes
Leipper	Backing Up the Model 100	2:189		100	Provides automatic tape back-up for Model 100 files
Oppedahl	The Searcher	6:157		100	Search Model 100 .DO files for specific words and phrases
Perry	Etch-A-Screen	7:131		100	Free-draw graphics program
Ramella	Autoliner	1:178		100	Automatically numbers Basic program lines
Ramella	The Shadow Knows	2:187		100	Encode Model 100 files you want kept secret
Ramella	Getting Personal	6:161		100	Prints personalized form letters
Robb	Wipe Out	3:192		100	A file deletion program that simplifies killing
Robb	Calling Wall Street	4:178		100	Calling the Dow Jones News/Retrieval Service
Robinson	Mnemonic Powers	1:170		100	A table of the Model 100's command mnemonics

COMMUNICATIONS

Author	Title	Issue:Page	Debug	Model	Annotation
Fischer	Smart Talk	5:50		I, III	A smart terminal program

DATA BASE MANAGERS

Author	Title	Issue:Page	Debug	Model	Annotation
Cirkovic	Little Wonder	12:72		I, III	A fast 200-record data base manager
Tonkin	The Creator is Back	2:68		I, III	An enhanced version of the original Creator data base manager

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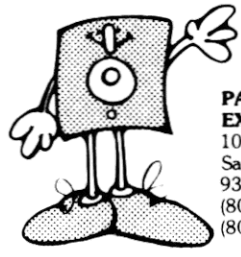

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EDUCATION

Author	Title	Issue:Page	Debug	Model	Annotation
Engelhardt	Synthetically Speaking—Part II	2:126		I, III	Educational software for the synthetic speech board in Part I (see Hardware)
Savard	Testing 1-2-3	10:70		I, III	A test-generating program

FILE-HANDLING

Author	Title	Issue:Page	Debug	Model	Annotation
Baker	Using Data Files—Part II	3:148		I, II, III	Creating and using random-access data files
Balonis	Pin Pals	2:194		100	Transfer Basic and text files between two Model 100s
Balonis	Sort Order	7:126		100	Alphabetize your data files
Goss	Phantom Disk	1:158		4	Make fast random-access searches with Memdisk
Jansen	Shorter Sorts	5:62		III	Sort VisiCalc data using the data interchange format
Leipper	Backing Up the 100	2:189		100	Provides automatic tape back-up for Model 100 files
Oppedahl	The Searcher	6:157		100	Search Model 100 .DO files for specific words and phrases
Ramella	The Shadow Knows	2:187		100	Encoding Model 100 files you want kept secret
Wilson	Command Performance	6:62		4	Edit JCL files and automatically execute TRSDOS commands

FINANCE

Author	Title	Issue:Page	Debug	Model	Annotation
Athanasiou	The Taxman Cometh	1:100		I, III	Organize your financial records
Bazzell	Taking Stock	9:86		I, III	Organize your stock portfolio
Earp	In the Marketplace	7:82		I, III	Hone your investment skills
Leslie	Monitoring Financial Health	6:70		I, II, III, 100	Analyze the health of a corporation by its annual report
Parrish	The Bucks Start Here	1:160		I, III, 100	How to invest your income-tax refund
Robb	Calling Wall Street	4:178		100	Calling the Dow Jones News/Retrieval Service

GAME

Author	Title	Issue:Page	Debug	Model	Annotation
Barinstein	Attention Shoppers!	8:75		I, III	Find 12 items in a department store and check out
Blair	Touchdown!	12:103		III	Guide your football team to the top of the heap
Devore	Catacomb Conquest	8:78		I, III	Collect the treasure hidden in the catacombs
Kennedy	Ground Control to Major John	2:62		I, III	Famous astronaut has many adventures on his way back to earth
Pelletier	Bombs Away	8:74		I, III	Bomb the enemy's military installation
Roth	The Play's the Thing	2:52		III	Stage plays on your computer screen
Shoemaker & Gleckner	Wall Games	8:76		I, III	Knock the bricks out of the wall with this Breakout clone
Smith	Bugs from Outer Space—Part I	3:82		I, III	A tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part II	4:82		I, III	Part II of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part III	5:108		I, III	Part III of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part IV	6:101		I, III	Part IV of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part V	7:103		I, III	Part V of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part VI	8:88		I, III	The last installment of a six-part tutorial on writing Assembly-language games

GENERAL

Author	Title	Issue:Page	Debug	Model	Annotation
Andresen	Grand Opining	2:84		I, III	Tabulates the results of opinion polls
Cameron	Making the Upgrade	5:126		III	A description of what a Model III-to-4 upgrade includes
Goodwin	In One Port and Out the Other	3:122		4	A reference table for Model 4 port assignments
Kepner	Bill of Fair Repair	1:164		I, III, PC, 12, 100	A cost breakdown of Radio Shack repairs
Kepner & Robinson	. . . and Personal	5:91			An interview with Ed Juge
Maloney	Tandy Makes It Move	1:70		2000	Introduction to the Model 2000
Maloney	The Tandy 1000: A True-Blue Compatible	12:44		1000	Introduction to the Model 1000
Rigsby	Dot Talk	1:94		I, III	Produce braille text with either a letter-quality or daisy-wheel printer
Woodbury	Marking Time	5:96		2000	Benchmark tests on 10 micros, including the Model 2000

GRAPHICS

Author	Title	Issue:Page	Debug	Model	Annotation
Carmody	Graphic Results	4:188		100	Graphics for the 100
Cornman	A Real Sketch	5:158		100	A sketchpad graphics program
Goodwin	Restored Art	4:157		4	Access the graphics commands Set, Reset, and Point on the Model 4
Heisen	Basically Better Graphics	5:104		I, III	Run graphics programs eight times faster using the LSET and Reset commands
Lewis	Fill-Ins	10:126		I, III	Draw pictures on the screen and fill them in with a single keystroke
Marks	Designer Screens	6:82		I, III	Design up to 6,000 patterns on your screen

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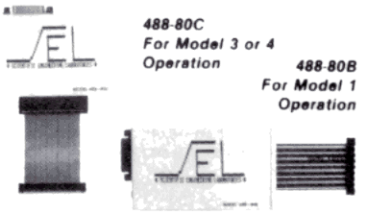

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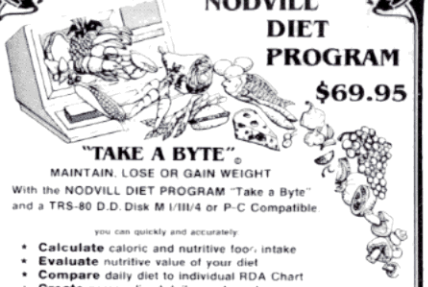

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Parkinson	Character Sketching	3:156		III	Use your Model III's special character set in documents
Perry	Etch-A-Screen	7:131		100	Free-draw graphics program
Tuck	A Piece of the Pie	3:142		I, III	Display statistical data in a pie graph

HARDWARE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Alford	Moving Up to 16 Bits	6:43		2000	A description of the 80186 chip and its 16-bit relatives
Calmettes	The Forgotten Interface	3:166		III	Use the I/O bus as an analog-to-digital converter
Clark	Drawing Boards	7:64		I, III, 4	Design a printed circuit board on the screen and print out a template of it
Deininger	Seven 100 Percent Solutions	2:186		100	Alternative ways to power your Model 100
Dixon	Thanks for the Memory	3:185		100	Install 8K memory chips in your Model 100
Engelhardt	Synthetically Speaking—Part I	1:142		I, III	Build a board that gives your computer speech capability
Engelhardt	Synthetically Speaking—Part II	2:126		I, III	Educational software for the synthetic speech board in Part I (see Education)
Kepner & Robinson	Up Close...	5:80		2000	Model 2000 review
Meyer	Drive Ways	9:42		III	Repairing and maintaining disk drives
Snider	Getting Loaded	3:180		III	Automatically load a 2K program into your cassette-based Model III with this add-on board
Wright	TRS-Nuke	3:50		I	Make your Model I simulate a nuclear power plant

HOME/HOBBY

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Athanasiou	The Taxman Cometh	1:100		I, III	Organize your financial records
Cirkovic	Little Wonder	12:72		I, III	A fast 200-record data base manager
Davis	The Sound of Musikon	4:138		I, III	Write and play compositions on the computer
Harris	North by Northwest	4:186	9:30	100	Determine the distance between any two locations on earth and get a compass bearing
Parrish	The Bucks Start Here	1:160		I, III, 100	How to invest your income-tax refund

INPUT/OUTPUT

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Calmettes	The Forgotten Interface	3:166		III	Use the I/O bus as an analog-to-digital converter
Glorvigen	Of Limited Values	6:134		I, III	Define the limits of data input with an Assembly-language subroutine
Goodwin	In One Port and Out the Other	3:122		4	A reference table for Model 4 port assignments
Goss	Phantom Disk	1:158		4	Make fast random-access searches with Memdisk
Kershner	Sneak a PEEK, Invoke a POKE	3:152	9:30		Improve your game programming with PEEK and POKE statements

INTERFACE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Balonis	100 Disks	1:171		100	Transfer Model I/III files and add manual disk storage to the Model 100
Balonis	Pin Pals	2:194		100	Transfer Basic and text files between two Model 100s
Calmettes	The Forgotten Interface	3:166		III	Use the I/O bus as an analog-to-digital converter
Cornman	Portable Scripsit	7:124		100	Translates Model III Scripsit tapes to Model 100 format

OPERATING SYSTEMS

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Harrell	The DOS Dilemma	7:48		I, III, 4	A look at Radio Shack and TRS-80-compatible disk operating systems
Heid	MS-DOS Overview	1:84		2000	Examines the major features of MS-DOS for the Model 2000
Heid	MS-DOS	3:74		2000	Describes the Model 2000's MS-DOS operating system

SCIENCE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Andreasen	Uncommon Denominators	6:139		I, II, III, 12, 16	A Basic program that accepts fractions as input and displays them as output
Cadmus	Fast Backwards	3:184		100	Using reverse Polish notation to do math calculations
DeJarnette	A Chill Wind Blows	12:120			Calculates wind chill using air temperature and wind speed
Harlow	Rooting Out the Problem	1:176		100	Plots data and determines the value of roots in equations
Husch	Relaxed Syntax	4:120		I, III	Interactive software that introduces you to artificial intelligence
Lewis	New Math—Old Order	4:116		I, III	Converting reverse Polish notation equations to traditional algebraic format
O'Reilly	The Whole Earth Computer	3:118			A gravity-powered computer that uses dominoes as bits

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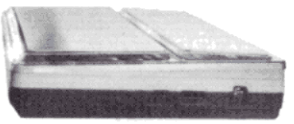

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O'Reilly	The Perfect Wave	10:130		I, III	Measuring distances with sound waves
van de Panne	Fractals: New Dimensions in Geometry	12:114		I, III	Using fractals for unique Model I/III graphics

SERIES

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Baker	Using Data Files—Part II	3:148		I, II, III	Creating and using random-access data files
Brothers	Assembly Language Made Simple—Part I	1:128		I, III	Part I of an Assembly-language tutorial
Brothers	Assembly Language Made Simple—Part II	2:108		I, III	Part II of an Assembly-language tutorial
Engelhardt	Synthetically Speaking—Part I	1:142	5:31	I, III	Build a board that gives your computer speech capability
Engelhardt	Synthetically Speaking—Part II	2:126		I, III	Educational software for the synthetic speech board in Part I (see Hardware)
Smith	Bugs from Outer Space—Part I	3:82		I, III	A tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part II	4:82		I, III	Part II of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part III	5:108		I, III	Part III of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part IV	6:101		I. III	Part IV of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part V	7:103		I, III	Part V of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part VI	8:88		I, III	The last installment of a six-part tutorial on writing Assembly-language games

TECHNIQUE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Conwell	Warnier Diagrams	10:134		I, III	An alternate to flowcharts
Cottle	Double Vision	6:113		I, III	Create a split-screen display
Covington	Rooting Out ROM Routines	10:120		III	Accessing the Model III's ROM subroutines
Diament	Sound Software	10:100		III	Digital speech synthesis
Harlow	Rooting Out the Problem	1:176		100	Plots data and determines the value of roots in equations
Husch	Relaxed Syntax	4:120		I, III	Interactive software that introduces you to artificial intelligence
Keen & Dischert	Borderline Case	2:158		I, III	Create customized screen borders
Kershner	Sneak a PEEK, Invoke a POKE	3:152	9:30	III	Improve your game programming with PEEK and POKE statements

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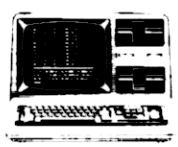

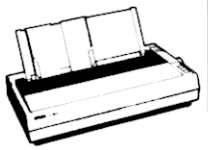

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Phelps	USR Friendly	10:100	I, III	An easy way to load USR routines with Basic programs
Powell	Plotting Along	5:68	I, III	Calculates and simultaneously graphs up to four equations

TUTORIAL

Author	Title	Issue:Page	Debug	Model	Annotation
Baker	Using Data Files—Part II	3:148		I, II, III	Creating and using random-access data files
Brothers	Assembly Language Made Simple—Part I	1:128		I, III	Part I of an Assembly-language tutorial
Brothers	Assembly Language Made Simple—Part II	2:108		I, III	Part II of an Assembly-language tutorial
Goss	Phantom Disk	1:158		4	Make fast random-access searches with Memdisk
Jones	The Great Escape	1:174		100	Explains Model 100 escape codes
King	Routine Access	4:168		I, III	Access up to 10 USR routines in Level II Cassette Basic
Levy	Everything from A to Z	4:53		All Models	Alphabetize your arrays
O'Reilly	The Whole Earth Computer	3:118			A gravity powered computer that uses dominoes as bits
Smith	Bugs from Outer Space—Part I	3:82		I, III	A tutorial on writing Assembly-language games
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Smith	Bugs from Outer Space—Part IV	6:101		I, III	Part IV of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part V	7:103		I, III	Part V of the tutorial on writing Assembly-language games
Smith	Bugs from Outer Space—Part VI	8:88		I, III	The last installment of a six-part series on writing Assembly-language games
Springer	Character Cache	4:118		I, III	Access some lesser-known Scripsit characters
Stedeford	Enter Here	4:107		I, III	A machine-language program that eliminates delays in entering string data
Sullivan	Random Thoughts	10:56		I, III, 4	A tutorial on random number generators
Williams	Print Statements	12:118		4	Solving printer and printer buffer problems

UTILITY

Author	Title	Issue:Page	Debug	Model	Annotation
Alexander	The Dating Game	10:114		4	Record the correct dates for CP/M Plus programs

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Allen	The (Single) Key to Scripsit and TRSDOS Commands	6:126	III	Single-key access to Scripsit and TRSDOS commands
Andreasen	Uncommon Denominators	6:139	I, II, III, 12, 16	A Basic program that accepts fractions as input and displays them as output
Barnard Jr. & Barnard	Touch or Sound Typing	1:88	I, III	Touch or sound typing for the handicapped
Blommers	Parallel Driving	3:126	I, III	A universal printer driver for SuperScripsit
Boggs	Basic Changes	11:56	I, III	Eleven commands to maintain Basic programs
Cominio	April Spool	4:77	I, III	A software printer spooler
Craft	Stepping Through Basic	2:56	III	Go through your Basic programs line by line to make changes
Diament	Hybrid Vigor	11:72	I, III	A Model I/III editor that combines the features of a line and a full-screen editor
Eggarter	Quit Stalling	11:86	III	Eliminate garbage-collection delays
Fink	One-Liners	8:50	I, II, III, 100	One-line Basic programs and routines you can use to enhance other programs
Firshein	From Soup to Nuts	5:169	100	A command menu to drive your Model 100 programs
Friedman	Thou Shalt Not Kill	11:138	I, III	Change your system's Kill command
Gaudreau	Belles Lettres	12:86		Create your own print fonts
Glorvigen	Of Limited Values	6:134	I, III	Define the limits of data input with an Assembly-language subroutine
Goben	Data Grabber	11:128	I, III	Reassign the data pointer to selectively access data blocks
Goodwin	Redevelopment Program	4:96	4	Convert Model III Basic programs to Model 4 format
Goodwin	Keeping Time	9:72	I, III, 4	Time your drives to help prevent disk I/O errors
Harrison & VanSlyck	Scripsit Extras	8:68	III	A patch that gives you 11 extra Scripsit characters
Kissel	Tape Transfer	11:125	III	Transfers NEWDOS80 source files from tape to disk with an LMOFFSET patch
Leipper	Backing Up the 100	2:189	100	Provides automatic tape back-up for Model 100 files
Milazzo	Basic Plus	11:44	III	Fourteen new Basic commands
Miller	The Screen Writer	11:98		Develop your own data-input screens
Monger	The Direct Approach	9:96	4	Program routines that let you access the keyboard and the screen
Payne	Brick by Brick	4:58	III	Edit the command file, stack commands on one line, specify conditional execution, and more

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WORD PROCESSING

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Allen	The (Single) Key to Scripsit and TRSDOS Commands	6:126		III	Single-key access to Scripsit and TRSDOS commands
Balonis	Write Now	2:191		100	A Model 100 word processor
Cornman	Form-matters	6:156		100	Converts Model 100 text files to Model III Scripsit
Cornman	Portable Scripsit	7:124		100	Translates Model III Scripsit tapes to Model 100 format
Hinrichs	The Return of Hinrichs' Word Processor	3:100		I, III	Insert graphics, names, and addresses into form letters
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Q: If I buy a software package from Tandy/Radio Shack, do I get support from Radio Shack or from the manufacturer?

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Q: What is Radio Shack's Express Order Software (EOS) service, and how does it work?

A: *It's a method of marketing third-party-vendor software through Radio Shack outlets. EOS gives software makers a ready-made distribution chain and makes more high-quality, brand-name software available to our customers.*

After our Outside Software Support Group analyzes a third-party product, we stock the software at Tandy's main Fort Worth warehouse. Radio Shack store personnel and customers are made aware of a product's availability through in-store product descriptions, known as the Directory of Reviewed Software, which is frequently updated. We highlight some EOS products in the regular Radio Shack Computer Center catalog; national advertising also helps spread the word.

Software analysis consists of making sure the package runs on the target computer and lives up to its documentation's claims. We also consider the quality of customer support. We don't make judgements about what features belong in a program; if a program is popular, we figure customers must want it the way it is.

You can place EOS orders at any Radio Shack Computer Center, Radio Shack store, or participating dealer. Orders are sent to Fort Worth the same day, and the product is usually shipped within 24 hours.

Q: Is the Model I still made in Europe?

A: *The Model I is no longer being produced anywhere.*

Q: Has the Tandy 2000 hurt sales of the Model 12?

A: *While we know that some customers who would have bought a Model 12 are buying Tandy 2000s instead, the introduction of the 2000 hasn't hurt the overall sales of the Model 12. The Model 12/Tandy 2000 combination lets us meet the needs of a wider range of customers than we could with the Model 12 alone. The net effect is increased overall sales and more satisfied customers.*

Q: Why did you change the keyboard on the Model 4?

A: *As an enhancement to the Model 4 product line, cursor control keys are clustered on newer machines. This makes the computer easier to use for word processing, spreadsheets, and other applications. We also include green screens on all new Model 4's.*

Q: Why was CP/M Plus for the Model 4 so late?

A: *It simply took longer to get the banked and unbanked versions running than anyone had projected. Had we gone for a less capable version of CP/M, we probably could have had it out much sooner, but we felt the Plus enhancements and banking were worth waiting for.*

Q: Rumor has it that the Model 4 was originally designed to accept the Z800 8/16-bit microprocessor. Is this true? Has Radio Shack ever considered the Z800?

A: *The Model 4 was designed to accept a Z800 adapter board for expandability. Due to development problems, Zilog has never produced the part. If the Z800 is ever produced, we'll consider an expansion board for an upgrade.*

Q: Is there a future for 8-bit machines?

A: *Yes. Most users don't really care what microprocessor is running as long as the computer does what they want. The Model 4 is one of the best-selling products in our computer family. Our introduction of the Model 4P and Apple's introduction of the IIc prove that both companies expect the 8-bit market to remain healthy. The best feature any computer can offer is a large software base. The Model 4 and Color Computers offer just that.*

Q: Why did Tandy discontinue the Model III hi-res graphics board?

A: *The Model III graphics board hasn't been discontinued. In fact, we've promoted the Model III graphics board twice recently to stimulate sales. Being a retailer, our primary goal is to sell products. Consumer feedback has taught us that the Model III graphics board was too expensive. Thanks to new custom circuitry, we were able to bring down the cost of the Model 4 graphics board.*

Q: Why did Radio Shack cancel the Tandy 2000's TV/Joystick interface?

A: *Analysis of the typical Tandy 2000 customer showed us that there wasn't enough demand to justify producing the board. The Tandy 2000's primary use is for business applications where the higher resolution of a monitor is needed.* ■

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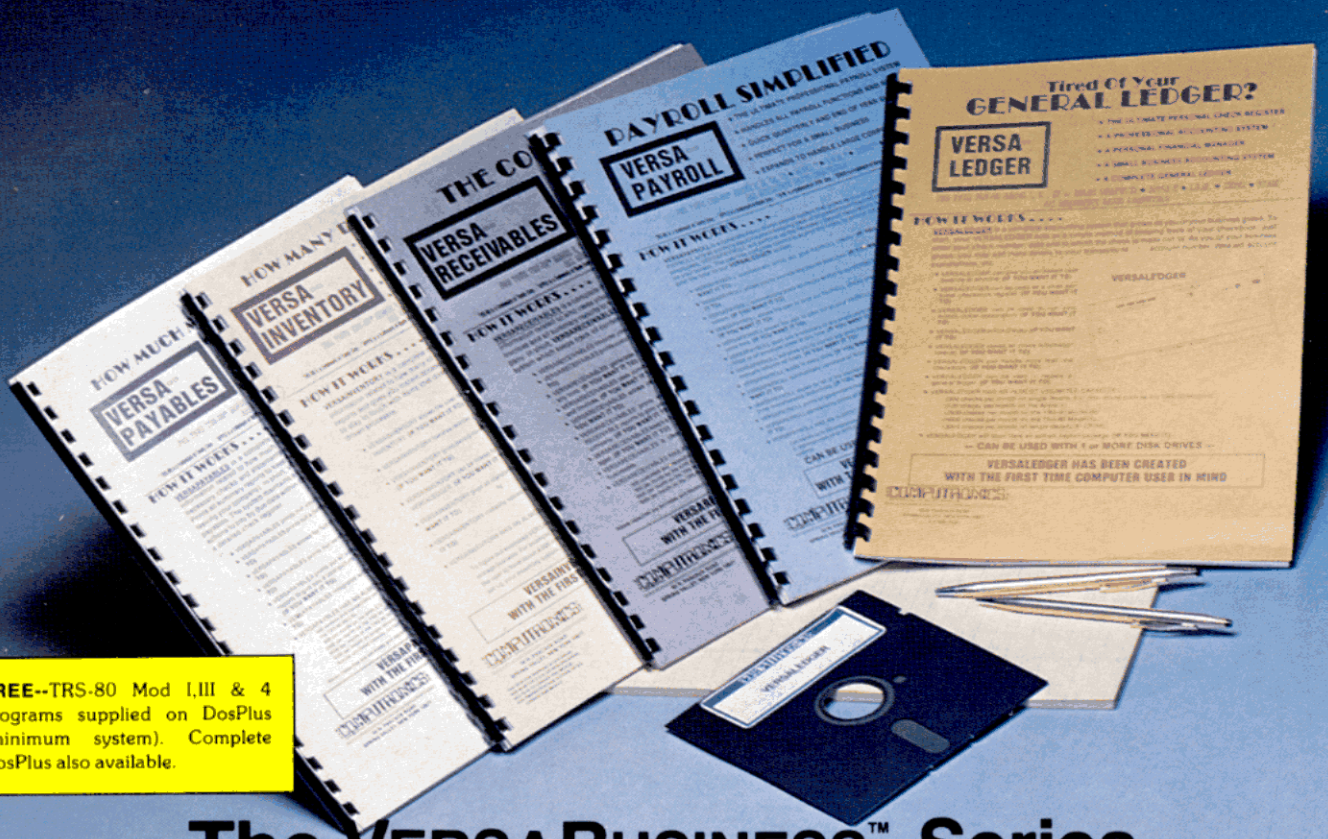

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